Computing Now!

Canada's Personal Computing Magazine

SEPTEMBER 1984

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Survey of 150 Computers

- Character for the IBM PC
- Commodore 8296
- Unpacked
- terize counts
- Down to the Ships in C
- Sight and Sound for the Apple

Almost Free PC Software

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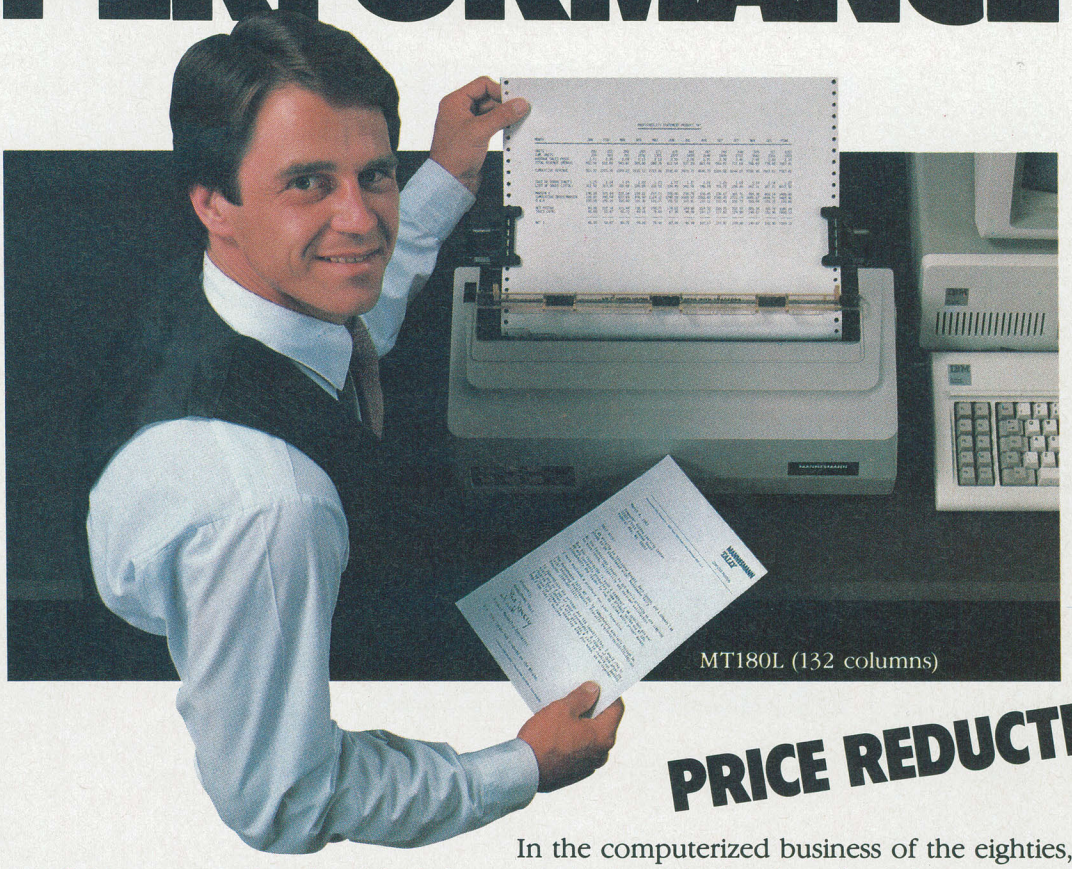

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You can quickly run down the extensive menu of print styles and word processing enhancements, making selections at a touch. On *L* models, switch from draft mode to letter quality just as easily and get results the *Creative Computing* magazine calls "superb."

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Telex: **06 522 873**

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For less than the cost of other comparable systems, the BEST offers you a sixteen bit 8088 based computer compatible with most MS-DOS based software.

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  holds 340K.
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  Shugart double sided double density drives.
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Computing Now!

Canada's Personal Computing Magazine

Vol. 2 No. 6
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Godzilla Meets All The BBS Numbers in the World 6

Survey of 150 Computers 8

Computerizing the Accounts 32

Computer Museum 36

Sight and Sound for the Apple 42

Classic Music Machine 43

Graphics Tool Kit Review 45

CBM 8296 50

Character for the IBM PC 58

Down to the Ships in C 65

Stockboy Menu 72

CP/M's Good Host 74

Birth of a Hero 84

Sectors

Almost Free PC Software 23
TRS-80 Model II MDM730 35
Computer Press 39
Next Month 39
ETI 44
Computers in Small Business 53
Computers in Education 61
Apple MDM730 62
Hot T Shirts 71
Announcement 73
Books 80
Software Now 82
Order Form 88
Book of the Month 88
Official Subscription Rebus 87
Binders 88
Product Mart 93
List 94
Guide to Advertisers 94

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ABC

Godzilla Meets All the BBS Numbers in the World

The phone numbers of computer bulletin board systems change almost as fast as election promises. This list is the most up to date we could make it and sure to keep your dialing finger going for evenings without end.

by Brian Greiner

And so, the three hundred baud knight took his vorple sword in hand and went off to slay slithy toves. He carried his gallant albino modem at his side for luck and because it was in the script. Within his armour he trembled despite his gallantry. The dreaded busy signal awaited.

The result of yet another forray of this champion of the phone lines, we present here an updated list of all the BBS numbers in the world with the expection of those that don't pay their phone bills in Canadian paper. All these numbers have been called, and are known to be active... at least they were at press time. The sands of BBS's, however, are forever shifting. Non-business hours should be assumed where no hours are posted. Most businesses need their phone lines from eight o'clock in the morning to five in the afternoon.

We have omitted those boards which overtly support software piracy and system cracking.

British Columbia			
604-764-7047	Kelowna	Kelowna BBS	
604-562-9519	Prince George	Prince George RCP/M	5 PM to 8 AM
604-563-9998	Prince George	TRS-80 BBS	24 hours
604-228-9051	Vancouver	UBC NIMNET	24 hours
604-263-8864	Vancouver	HOST	8:30 AM to 11 PM
604-272-2549	Vancouver	Startraders	24 hours
604-299-4496	Vancouver	H and S Microsystems	24 hours
604-321-1130	Vancouver	I.A.S.	24 hours
604-325-3811	Vancouver	Atari BBS	24 hours
604-435-2993	Vancouver	Kent Toy BBS	24 hours
604-438-2468	Vancouver	Satyricon CBBS	24 hours
604-461-4033	Vancouver	Columbia BBS	9 PM to 9 AM
604-464-7693	Vancouver	Poco BBS	24 hours
604-530-3161	Vancouver	Net Electronics	non-bus.
604-584-2731	Vancouver	CMOS	
604-585-0680	Vancouver	Delta-80	24 hours
604-588-3255	Vancouver	Sprite Computer	9 PM to 9 AM
604-594-7398	Vancouver	Comm80	9 PM to 9 AM
604-596-0146	Vancouver	Basic'ly	24 hours
604-596-0314	Vancouver	Fog RBBS-2	24 hours
604-731-2724	Vancouver	Kits BBS	24 hours
604-738-2773	Vancouver	CoCo Pacific	24 hours
604-922-1336	Vancouver	Apple Reich	24 hours
604-926-5070	Vancouver	Apple West	24 hours
604-937-0906	Vancouver	Frog Hollow	24 hours
604-946-0955	Vancouver	TVG	24 hours
604-381-2143	Victoria	IBMPCUG	
604-478-0625	Victoria	TecWorld	24 hours
604-478-2234	Victoria	DataWest	24 hours
604-652-5076	Victoria	Archer	24 hours
Alberta			
403-246-9272	Calgary	Apple BBS	10 PM to 4 PM
403-250-2488	Calgary	TCS/Computershop	NE
403-287-3638	Calgary	Computer Shop BBS	7 PM to 9 AM
403-436-1949	Edmonton	Conexions	24 hours
403-454-6093	Edmonton	Edmonton RCP/M	24 hours
403-463-5774	Edmonton	South Side RCP/M	24 hours
403-464-4172	Edmonton	Antithesystem	9 PM to 4 PM
403-466-7656	Edmonton	Commodore BBS	9 PM to 6 AM
403-471-2827	Edmonton	Westworld Net-Works	24 hours
403-471-8080	Edmonton	Stadium RCP/M	24 hours
403-474-0147	Edmonton	Northern Alta CoCo	6 PM to 3 PM
403-484-5981	Edmonton	Meadowlark RCP/M	24 hours
403-986-4025	Leduc	IBM PC Users' Group	6 PM to 2 AM
403-320-6923	Lethbridge	Gaming System	charges fee
Saskatchewan			
306-586-5585	Regina	EMIS	24 hours
306-665-7085	Regina	Gravestone BBS	24 hours
306-374-2391	Saskatoon	Color80	24 hours
Manitoba			
204-785-8742	Selkirk	MMS BBS	24 hours
204-942-1109	Winnipeg	VE4 Micro BBS	24 hours
Ontario			
519-853-1063	Acton		
705-737-1599	Barrie	Computerland	6 PM to 8 AM
416-632-5653	Burlington		
519-354-6827	Chatham	Chatham BBS	
705-445-6032	Collingwood	TBBS	
416-877-0933	Georgetown	HARC Ham Radio	
613-385-4598	Hamilton	HBO Atari BBS	24 hours
519-898-2969	Newmarket	9 PM to7 AM	
416-576-3213	Oshawa	CIBB	6:30 PM to 8 AM
613-230-7154	Ottawa	Compucentre	8:30 PM to 8 AM
613-236-1145	Ottawa	Alleycat	
613-523-1614	Ottawa	O.B.E.	
613-592-0240	Ottawa	Edu-Tot	
613-725-1538	Ottawa	Graffitti	
613-727-0575	Ottawa	Modem World	
613-748-1035	Ottawa	MMS	
613-820-4646	Ottawa	TBC-1	
613-820-4669	Ottawa	TBC-2	
416-839-3260	Pickering	Superboard	24 hours
807-345-7161	Thunder Bay	Chalkboard	
807-345-7199	Thunder Bay	ASC Microsystems	6 PM to 8 AM
807-622-2685	Thunder Bay	DataComm-80	24 hours
416-226-9260	Toronto	Willowdale CBBS	24 hours
416-231-0538	Toronto	Toronto RCP/M IV	24 hours
416-231-1449	Toronto	Toronto RCP/M II	24 hours
416-232-0269	Toronto	Toronto RCP/M III	24 hours
416-232-0442	Toronto	Toronto RCP/M I	24 hours
416-232-1262	Toronto	Toronto RCP/M V	24 hours
416-241-1659	Toronto	CAUG	6 PM to 9 AM
416-265-3227	Toronto	Bull '80	7:30 PM to 8 AM
416-281-9452	Toronto	After Hours	6 PM to 8 AM
416-293-7349	Toronto	Dragon's Den	24 hours
416-366-2069	Toronto	CFTR BBS	7 PM to 9 AM
416-367-4254	Toronto	Dial-Your-Match	24 hours
416-423-5149	Toronto	ETI/CN BULL	5 PM to 7 AM
416-425-6123	Toronto	Exceltronix On-Line	24 hours
416-429-6044	Toronto	TPUG-PET	24 hours
416-439-0065	Toronto	Games BBS	7 PM to 9:30 PM
416-445-3083	Toronto	Phobos II	9 PM to 8 AM
416-445-5192	Toronto	PMS LOGIC	24 hours
416-445-6696	Toronto	Toronto Net-Works I	24 hours
416-454-3046	Toronto	Info-Tek	9 PM - 6 PM
416-461-2110	Toronto	CBBS Toronto	24 hours
416-482-2823	Toronto	NightOwl	24 hours
416-484-9663	Toronto	EM-X BBS	24 hours
416-487-5833	Toronto	BBBBS I	24 hours
416-493-2408	Toronto	TOC	
416-499-7023	Toronto	PCanada-IBM	24 hours
416-534-2859	Toronto	VidTek	24 hours
416-535-5360	Toronto	UTBBS	7 PM to 7 AM
416-593-7460	Toronto	Arkon Infosystem	24 hours
416-622-2462	Toronto	Atari Infosystem	24 hours
416-622-7350	Toronto	Starship Atari	24 hours
416-624-5431	Toronto	PSI-Wordpro BBS	6 PM to 9 AM
416-640-3434	Toronto	Business Board	24 hours
416-665-2177	Toronto	Swappe Shoppe	24 hours
416-683-3733	Toronto	Toronto Net-Works II	24 hours
416-698-0619	Toronto	Modem Astrology	24 hours
416-743-6221	Toronto	CoCo Nut	24 hours
416-757-0781	Toronto	Global Software Labs	
416-787-8630	Toronto	SkiBBS/NetCan][	24 hours
416-884-6198	Toronto	RTC BBS	6 PM to 9 AM
416-886-0446	Toronto	City Classified	
416-925-2910	Toronto	TRACE BBS	24 hours
416-925-8291	Toronto	Parts Galore	7 PM to 8 AM
416-964-6886	Toronto	Buy and Sell	24 hours
416-668-2078	Whitby		
Quebec			
418-659-3863	Quebec City	Telesiaq	6 PM to 9 AM
514-481-6329	Montreal	RCP/M	6 PM to 8 AM

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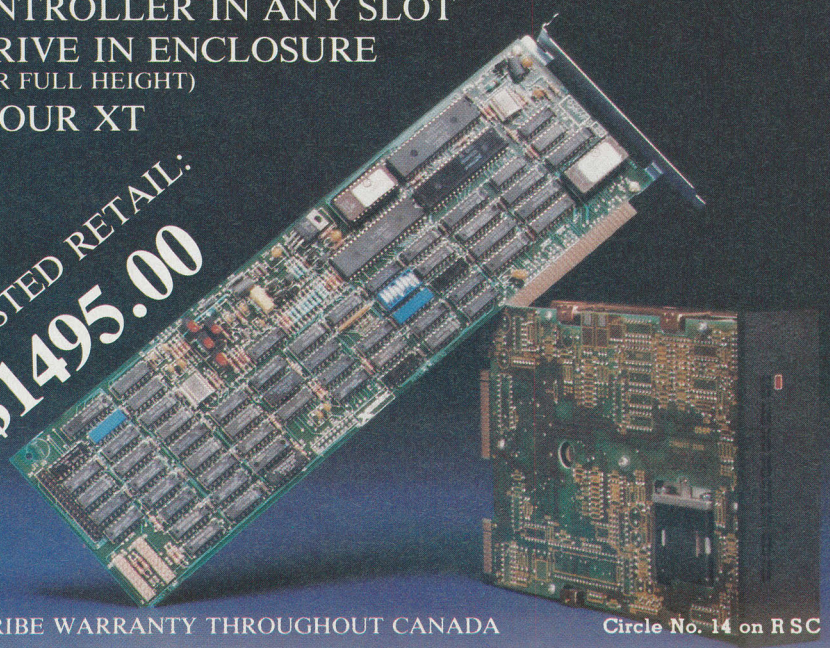

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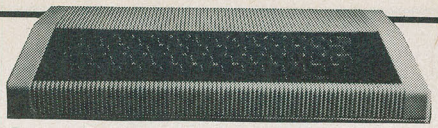
Survey of 150 Computers

Once again we are pleased to present our bi-annual survey of systems. This edition sees quite a number of changes in the microcomputer industry, as a few new machines have cropped up... and a number have drifted into the never-never lands of obsolescence and financial insolvency.

In a sense, the last six months have seen a lot of growing up on the part of the companies who build micros... those which have sound products and reliable operations have largely survived the ravages of the economy and galloping technology.

A few, however, have faded away to nothing more than phone numbers no longer in service.

This survey represents some fairly powerful technology. Some of it is brand new, but quite a lot is existing hardware made more capable through innovation and enhancement. No matter what sort of system you're looking for you'll find a number of suitable machines in the next few pages.



Acorn Atom

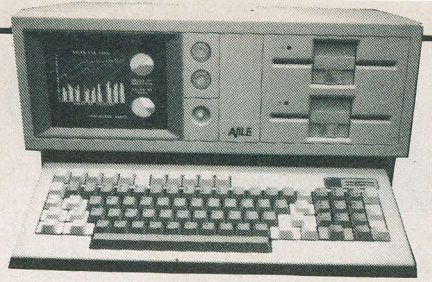
Operating System:	BASIC
Processor(s):	6502
RAM:	2K
Printer I/O:	Optional serial or parallel
Disk Drives Inc.:	Optional
Screen Format:	32x16
Graphics:	256x192
Sound:	Yes
Colour:	Optional
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Acorn Computers
Available From:	Gladstone Electronics
Suggested Retail:	$99.95; 12K RAM model $199.95

Actrix Portable

Operating System:	CP/M
Processor(s):	Z80A (optional 8088)
RAM:	64K
Printer I/O:	Two serial, one parallel and one IEEE
Disk Drives Inc.:	Two SS DD drives
Screen Format:	80x25
Graphics:	126 graphics characters
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Perfect Writer/Speller/Calc/Filer; Fancy Font
Weight:	33 lbs.
Primary Market:	Business
Manufacturer:	Access Matrix Corp.
Available From:	Kobetek Systems Ltd.
Suggested Retail:	$3195.00
Other:	Built-in 8x9 dot matrix printer

Advanced Personal Computer III

Operating System:	MS-DOS
Processor(s):	NEC 8086 (8 MHz)
RAM:	128K
Printer I/O:	One parallel, one serial
Disk Drives Inc:	One or two 5¼" floppy, or hard drive with 5¼" floppy
Screen Format:	40/80x25
Graphics:	640x400 pixels; colour and monochrome
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS, GW BASIC
Primary Market:	Business
Manufacturer:	NEC
Available From:	Micro Computers of Canada
Suggested Retail:	$2995.00 for one drive. $5995.00; hard drive version
Other:	Monitor included

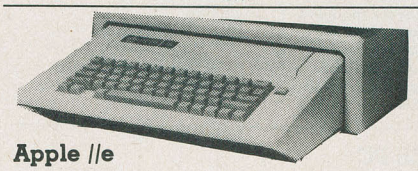


Ajile II

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Two 5 1/4" DS DD floppy
Screen Format:	80x25
Graphics:	640x250 pixels
Sound:	Programmable
Colour:	No
Keyboard:	Detachable
Software Included:	In:Scribe, Multiplan
Weight:	9.6 kg.
Primary Market:	Business
Manufacturer:	Bytec-Comterm
Available From:	Anderson Jacobson
Suggested Retail:	$3190.00
Other:	Single drive version; $2730.00

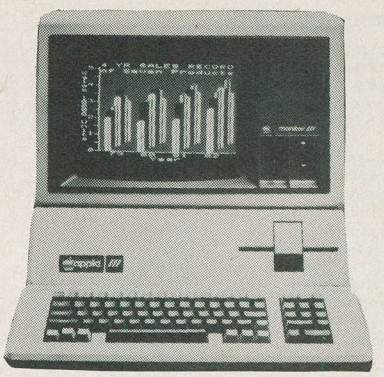
Apple //c

Operating System:	BASIC
Processors:	65C02
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc:	One SSSD 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	280/560x192 pixels
Sound:	Yes; volume control and headphone jack
Colour:	Yes
Keyboard:	Integrated
Software Included:	Four disk introduction, system utilities
Weight:	3.4 Kilograms
Primary Market:	Home
Manufacturer:	Apple Computer
Available From:	Local dealers
Price:	$1895.00
Other:	No slots. Ports for printer, second drive, modem, RGB monitor or television, composite monitor, mouse or joystick/paddles.



Apple //e

Operating System:	BASIC
Processor(s):	6502A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional
Screen Format:	40x24: Optional 80x24
Graphics:	280/560x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business and home
Manufacturer:	Apple Computer
Available From:	Local dealers
Suggested Retail:	$1295.00
Other:	Self-test mode



Apple ///+

Operating System:	BASIC
Processor(s):	6502B
RAM:	256K
Printer I/O:	Serial
Disk Drives Inc:	One 5 1/4" DD floppy
Screen Format:	80x24
Graphics:	560x192
Sound:	Optional
Colour:	Optional
Keyboard:	Integrated
Software Included:	SOS
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local dealers
Suggested Retail:	$4295.00; business unit $6495.00
Other:	Business unit has 5 megabyte hard drive, monitor and Catalyst software

Apple Lisa 2

Operating System:	Integrated icon software
Processor(s):	68000
RAM:	512K
Printer I/O:	2 serial, 1 parallel
Disk Drives Inc:	One 3 1/2" microfloppy
Screen Format:	Variable
Graphics:	720x360 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Macintosh Operating System
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local dealers
Suggested Retail:	$4995.00
Other:	Can run Macintosh software

Apple Lisa 2/5

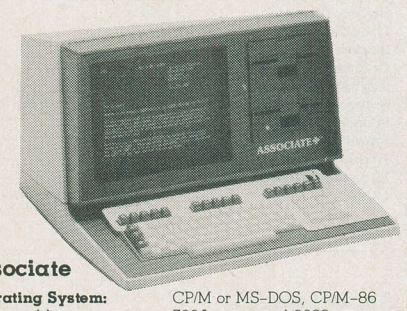
Operating System:	Integrated icon software
Processor(s):	68000
RAM:	512K
Printer I/O:	2 serial, 1 parallel
Disk Drives Inc:	One 3 1/2" floppy, one 5 megabyte hard disk
Screen Format:	Variable
Graphics:	720x360 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local Dealers
Suggested Retail:	$6495.00
Other:	Can run Macintosh software

Apple Lisa 2/10

Operating System:	Integrated icon software
Processor(s):	68000
RAM:	512K
Printer I/O:	2 serial, 1 parallel
Disk Drives Inc:	One 3 1/2" floppy, one 10 mb hard disk
Screen Format:	Variable
Graphics:	720x360
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local Dealers
Suggested Retail:	$7995.00
Other:	Can run Macintosh software

Apple Macintosh

Operating System:	Macintosh Operating System
Processor(s):	68000
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc.:	One 3 1/2" drive standard
Screen Format:	Variable
Graphics:	512x342 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Graphics and word processing
Weight:	17 lbs.
Primary Market:	Home, business, educational
Manufacturer:	Apple Computer Corp.
Available From:	Apple Canada
Suggested Retail:	$3595.00; $4295.00 with Imagewriter printer
Other:	Visually-oriented; mouse included



Associate

Operating System:	CP/M or MS-DOS, CP/M-86
Processor(s):	Z80A or optional 8088
RAM:	128K
Printer I/O:	3 serial, one IEEE, optional parallel
Disk Drives Inc:	Two DS DD 5 1/4" floppy or optional 10 mb hard drive
Screen Format:	80x25 or 132x25
Graphics:	32 graphics characters, 256 user definable
Sound:	Yes
Colour:	Optional
Keyboard:	Integrated
Software Included:	Microplan, Spellbinder, acc pak
Primary Market:	Business or personal
Manufacturer:	Associate
Available From:	Datacalc Technology Ind Corp.
Suggested Retail:	$4495.00
Other:	114 function keys

Atari 600XL

Operating System:	BASIC
Processors:	6502
RAM:	16K
Printer I/O:	Parallel
Disk Drives Inc:	Optional disk drive or recorder
Screen Format:	40x24
Graphics:	320x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Atari
Available From:	Irwin Electonics
Price:	$239.00
Other:	CP/M option

Atari 800 XL

Operating System:	BASIC
Processors:	6502
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc:	Optional
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home or Business
Manufacturer:	Atari
Available From:	Irwin Electronics
Price:	From $399.00 to 449.00
Other:	CP/M optional

AVT Comp 2

Operating System:	BASIC and CP/M
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc.:	One 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable; 8 function keys
Software Included:	BASIC
Primary Market:	Personal or business
Manufacturer:	AVT, Switzerland
Available From:	Bee Microsystems
Suggested Retail:	$1495.00 including monitor
Other:	Apple compatible

BEE PC

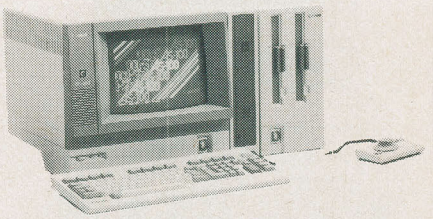
Operating System:	CP/M-86 and MS-DOS
Processor(s):	8088 and Z80
RAM:	128K
Printer I/O:	One parallel and two serial
Disk Drives Inc:	One 5¼" DS DD floppy
Screen Format:	40/80x24 pixels
Graphics:	640x320
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	Bee Microsystems
Available From:	Local dealers
Suggested Retail:	$2795.00
Other:	10 programmable function keys

B.E.S.T.

Operating System:	MS-DOS or CP/M-86 optional
Processor(s):	8088
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One DD DS floppy
Screen Format:	80x24
Graphics:	640x325 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	Multiflex
Available From:	Exceltronix
Suggested Retail:	$1995.00
Other:	IBM PC compatible

The Big Blue Board

Operating System:	MS-DOS or CP/M-86
Processor(s):	8088 (optional 8087)
RAM:	128K; expandable to 256K
Printer I/O:	Optional card
Disk Drives Inc:	One slimline 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	DOS BIOS in EPROM
Primary Market:	Business
Manufacturer:	Robin Hood Electronics
Available From:	Robin Hood Electronics
Suggested Retail:	$2495.00 including monitor and keyboard
Other:	IBM compatible



Canon AS-100

Operating System:	CP/M or DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" or 8" floppy or 5" hard
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	2 BASICs
Primary Market:	Business
Manufacturer:	Canon
Available From:	Office Equipment
Suggested Retail:	$3525.00
Other:	Available with colour ink jet printer

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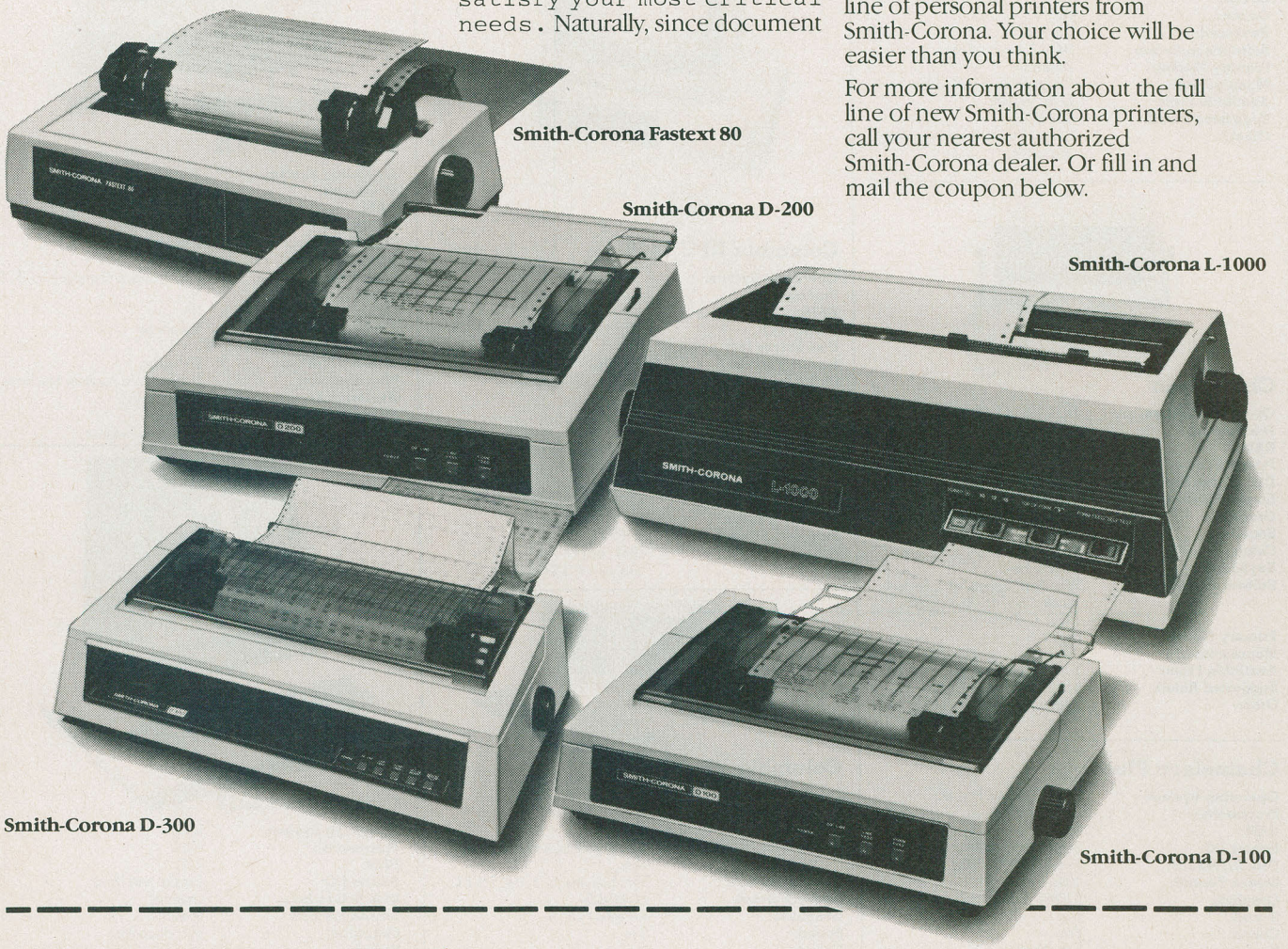

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Smith-Corona D-200

Smith-Corona L-1000

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Circle No. 31 on Reader Service Card.

CBM 8296

Operating System:	CBM BASIC 4.0
Processor(s):	6502
RAM:	96K
Printer I/O:	IEEE-488, eight-bit user bus
Disk Drives Inc:	Optional single or dual 5¼" floppy
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	BASIC, Execu-Desk
Primary Market:	Business
Manufacturer:	Commodore Business Machines
Available From:	Local dealers
Suggested Retail:	$1695.00
Other:	Execu-Desk software requires disk drive.

Chameleon

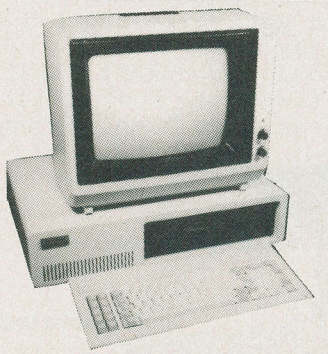
Operating System:	DOS 1.25 or CP/M 80
Processor(s):	Z80 and 8088
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One DS DD 5¼" floppy
Screen Format:	40/80x25
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
SoftwareIncluded:	WordStar, SuperCalc³, PerfectWriter/Calc,MS-DOS,GWBASIC, C Term
Primary Market:	Business
Manufacturer:	Seequa
Available From:	York Computers
Suggested Retail:	$1995.00
Other:	9" monitor

Chameleon Plus

Operating System:	DOS 1.25 or CP/M 80
Processor(s):	Z80 and 8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two DS DD 5¼" floppy
Screen Format:	40/80x25
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Same as Chameleon, but with Condor I and Perfect Speller
Primary Market:	Business
Manufacturer:	Seequa
Available From:	York Computers
Suggested Retail:	$2695.00
Other:	9" monitor

Coleco Adam

Operating System:	SmartBASIC
Processor(s):	Z80A
RAM:	80K
Printer I/O:	Serial plus 4 ports
Disk Drives Inc.:	Digital cassette (50 ips.)
Screen Format:	36x25
Graphics:	N/A
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	SmartWriter, SmartBASIC, game
Primary Market:	Home or business
Manufacturer:	Coleco
Available From:	Local dealers
Suggested Retail:	$999.00
Other:	Letter quality printer included

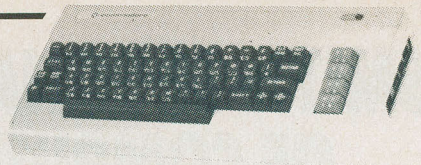


Columbia NPC 1600-1

Operating System:	CP/M-86 and MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	Dual 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Two operating systems, Perfect software
Primary Market:	Business
Manufacturer:	Columbia Data Systems
Available From:	Peripherals Plus
Suggested Retail:	$3399.00
Other:	IBM compatible; 10 mb hard disk model $5999.00

Columbia VP

Operating System:	CP/M 86, MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial, parallel and seven exp. slots
Disk Drives Inc.:	Two half-height 5 1/4" DS DD
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Perfect series, Fast Graphics
Weight:	32 lbs.
Primary Market:	Business
Manufacturer:	Columbia Data Systems
Available From:	Peripherals Plus
Suggested Retail:	$2999.00



Commodore 64

Operating System:	BASIC
Processor(s):	6510
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc.:	Optional 5 1/4' drive
Screen Format:	40x25
Graphics:	320x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Commodore
Available From:	Local retailers
Suggested Retail:	$429.95

Commodore 4032

Operating System:	BASIC
Processors:	6502
RAM:	32K
Printer I/O:	IEEE, parallel
Disk Drives Inc:	Optional
Screen Format:	40x24
Graphics:	128 graphics characters in ROM
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Education
Manufacturer:	Commodore Business Machines
Available From:	Local dealers
Suggested Retail:	$1095.00
Other:	Integrated monitor

Commodore 8032

Operating System:	BASIC
Processor(s):	6502
RAM:	32K
Printer I/O:	Parallel and IEEE
Disk Drives Inc.:	Optional
Screen Format:	80x25
Graphics:	128 characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC Educational software
Primary Market:	Educational
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1395.00

Commodore 8096

Operating System:	BASIC
Processors:	6502 and 6809
RAM:	96K
Printer I/O:	Serial and IEEE
Disk Drives Inc:	Optional
Screen Format:	80x25
Graphics:	128 graphic characters in ROM
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1695.00

Commodore Executive 64

Operating System:	PET BASIC
Processor(s):	6510
RAM:	64K
Printer I/O:	Serial and IEEE
Disk Drives Inc.:	One 5 1/4" drive
Screen Format:	40x25
Graphics:	320x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Weight:	27.6 lbs.
Primary Market:	Business
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1499.95

Commodore SuperPET

Operating System:	microBASIC
Processor(s):	6502 & 6809
RAM:	96K
Printer I/O:	Serial and IEEE
Disk Drives Inc.:	Optional
Screen Format:	80x25
Graphics:	128 characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	Waterloo APL/BASIC/COBOL/FORTRAN/PASCAL
Primary Market:	Education
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1795.00
Other:	Integrated monitor

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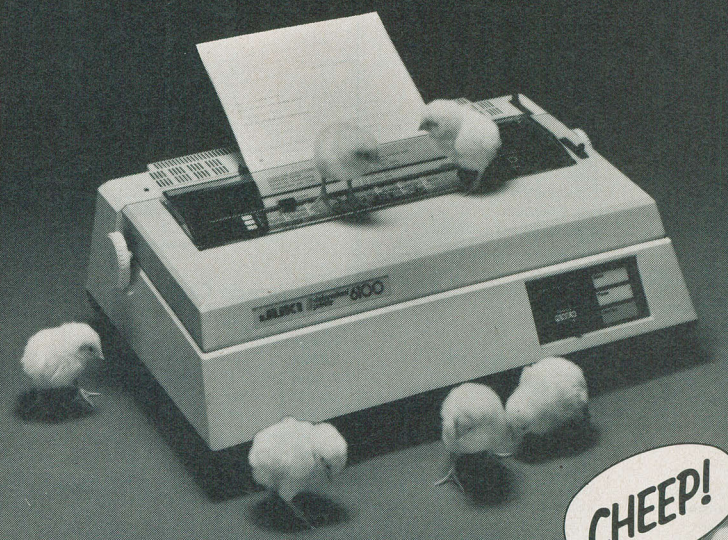

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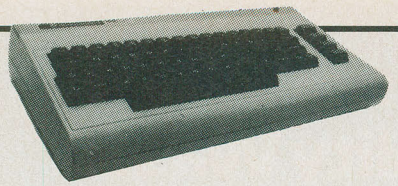


Commodore VIC 20

Operating System:	BASIC
Processor(s)	6502
RAM:	5K
Printer I/O	Serial
Disk Drives Inc.:	Optional 1541 SSSD floppy
Screen Format:	22x23
Graphics	178x184
Sound	Yes
Colour	Yes
Keyboard	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Commodore
Available From:	Local retailers
Suggested Retail:	$99.95 without datasette

Copam PC-301

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	One parallel, two serial
Disk Drives Inc:	Two floppy
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS, CP/M-86
Primary Market:	Business
Manufacturer:	Copam Canada
Available From:	Universal Computer Systems
Suggested Retail:	$3495.00
Other:	IBM compatible

Corona PC

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two DSDD floppy
Screen Format:	80x24
Graphics:	640x325 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Multimate 3.26, MS-DOS 2.0
Primary Market:	Business
Manufacturer:	Corona
Available From:	Scarsdale Technology, CDI
Suggested Retail:	$3225.00 - $3990.00; Hard disk version $5995.00
Other:	Can mix text and graphics

Corona Portable

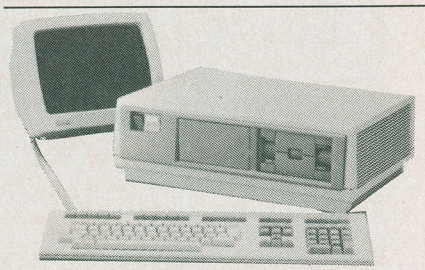
Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	Serial and parallel; four exp. slots
Disk Drives Inc.:	Two DD DD floppy
Screen Format:	80x24
Graphics:	640x325 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	MS-DOS 2.0, Multimate 3.26
Weight:	28 lbs.
Primary Market:	Business
Manufacturer:	Corona
Available From:	Scarsdale, CPI
Suggested Retail:	$3225.00 - $3990.00; Hard disk version $5995.00

Cromemco C-10SP

Operating System:	CP/M COMP
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two DS DD floppy drives
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	BASIC, word processor, spreadsheet
Primary Market:	Business
Manufacturer:	Cromemco
Available From:	Computerland
Suggested Retail:	$1785.00

Data-2000

Operating System:	Proprietary
Processor(s):	Proprietary 4-bit CPU
RAM:	2K CMOS
Printer I/O:	N/A
Disk Drives Inc:	N/A
Screen Format:	10x4
Graphics:	10 graphics characters in ROM
Sound:	Yes
Colour:	No
Keyboard:	Separate from watch
Software Included:	N/A
Primary Market:	Business, students
Manufacturer:	Hattori-Sejko Company Ltd.
Available From:	SC Time Canada
Approximate Retail:	$260.00 with keyboard and batteries
Other:	4-function calculator, calendar, data entry, contrast adjustment



DEC Decmate II

Operating System:	Proprietary DOS
Processor(s):	12 bit 6120
RAM:	96K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80/132x24
Graphics:	N/A
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	WPS, CP/M
Primary Market:	Business
Manufacturer:	Digital Equipment
Available From:	Local Dealers
Suggested Retail:	$10,000

DEC Rainbow 100

Operating System:	CP/M-86 or MS-DOS
Processor(s):	Z80 and 8088
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc:	One drive accommodating two 5 1/4" disks
Screen Format:	80/132x24
Graphics:	Optional; 800x240 pixels
Sound:	No
Colour:	Optional; palette of 1,024 colours
Keyboard:	Detachable
Software Included:	Choice of CP/M-86 or MS-DOS
Primary Market:	Business
Manufacturer:	Digital Equipment
Available From:	Local Dealers
Suggested Retail:	$4600.00

DEC Rainbow 100+

Operating System:	CP/M-86/80 or MS-DOS
Processors:	Z80 and 8088
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc:	One dual-diskette drive, one 10 Mb hard
Screen Format:	80/132x24
Graphics:	Optional; 800x240 pixels
Sound:	No
Colour:	Optional; palette of 4,096 colours
Keyboard:	Detachable
Software Included:	Choice of CP/M-86 or MS-DOS
Primary Market:	Business
Manufacturer:	Digital Equipment
Available From:	Local dealers
Price:	$7500.00

Dimension 68000

Operating System:	CP/M-68K
Processor(s):	68000L8
RAM:	256K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	Two 5¼" DS DD floppy
Screen Format:	20x20 to 100x50
Graphics:	160x480 pixels to 640x480 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC, CP/M-68K, C, 68000 assembler
Primary Market:	Business
Manufacturer:	Micro Craft Corporation
Available From:	Popular Electronic Products
Suggested Retail:	$6495.00; 512K version with all emulation packages is $7995.00
Other:	Can emulate Apple][+, IBM PC, Kaypro, Osborne and others with optional hardware and software.

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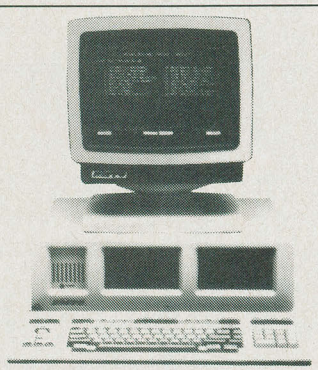
Circle No. 32 on Reader Service Card

DOT Portable

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial
Disk Drives Inc.:	Two 3 1/2" SS DD
Screen Format:	80x25
Graphics:	1056x254 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	MS-DOS
Software Available:	Lots; IBM compatible
Weight:	31 lbs.
Primary Market:	Business
Manufacturer:	Computer Devices
Available From:	Datamex
Suggested Retail:	N/A
Other:	Integrated printer

Durango Poppy

Operating System:	MS-DOS, Concurrent CP/M
Processor(s):	80186; optional 80286
RAM:	128K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	One 819K floppy
Screen Format:	80x25
Graphics:	No
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	MS-DOS
Primary Market:	Business
Manufacturer:	Durango Systems Inc.
Available From:	Norango Computer Systems Inc.
Suggested Retail:	$5700.00
Other:	14" monitor and station included



Durango Poppy II

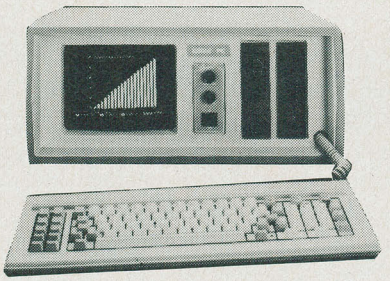
Operating System:	XENIX, MS-DOS, Concurrent CP/M, CP/M-86, BOS/5, DX85M
Processor(s):	80186 and 80286
RAM:	384K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	One 819K floppy, one 10 Mb drive (optional 20 Mb or 40 Mb hard drive)
Screen Format:	80x25
Graphics:	No
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	XENIX
Primary Market:	Business
Manufacturer:	Durango Systems Inc.
Available From:	Norango Computer Systems Inc.
Suggested Retail:	$15495.00
Other:	14" monitor and station; up to 12 users

Eagle PC+ I/PC +II

Operating System:	MS-DOS 2.1, CP/M-86, GWBASIC
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	One 5¼" floppy; PC +II has two
Screen Format:	40/80x25
Graphics:	Optional card... 640x200 pixels
Sound:	Yes
Colour:	Optional card
Keyboard:	Detachable
Software Included:	MS-DOS, BASICA
Primary Market:	Business
Manufacturer:	Eagle Computers
Available From:	DataTech Systems Ltd., Leading Source
Suggested Retail:	$2740.00 (PC +I), $3330.00 (PC +II)
Other:	Monitor optional

Eagle PC+ XL

Same as the Eagle Plus, but with 10 megabytes of integrated hard storage. $5980.00



Eagle Spirit II

Operating System:	MS-DOS, CP/M-86, GWBASIC
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	Two 5¼" floppy
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS 2.1, BASICA
Weight:	33 lbs.
Primary Market:	Business
Manufacturer:	Eagle Computers
Available From:	DataTech Systems Ltd., Leading Source
Suggested Retail:	$4065.00
Other:	Integrated 9" monitor

Eagle Spirit XL

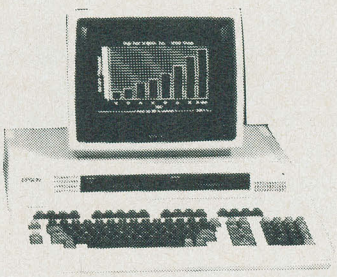
Same as the Eagle Spirit, but includes integrated 10 megabyte hard drive. $5980.00

Eagle Turbo XL

Operating System:	MS-DOS
Processor(s):	8086 (8 MHz-4.77 MHz switchable)
RAM:	256K
Printer I/O:	One parallel
Disk Drives Inc:	One 5¼" floppy, one 10 Mb hard
Screen Format:	40/80x25
Graphics:	Optional card... 640x200 pixels
Sound:	Yes
Colour:	Optional card
Keyboard:	Detachable
Software Included:	BASICA, MS-DOS
Primary Market:	Business
Manufacturer:	Eagle Computer
Available From:	Datatech Systems Ltd., Leading Source
Suggested Retail:	$7450
Other:	Eight slots

Epson HX 20

Operating System:	BASIC
Processor(s):	6301
RAM:	16K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Micro cassette
Screen Format:	20x4 LCD
Graphics:	120x32 pixels
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	SkiWriter
Weight:	1.73 kg.
Primary Market:	Business
Manufacturer:	Epson
Available From:	Epson Canada
Suggested Retail:	$1099.00
Other:	Notebook style; built-in printer



Epson QX-10

Operating System:	Valdocs
Processor(s):	Z80A
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two DS DD 5 1/4" floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Indexer, word processor, mail system, more
Primary Market:	Business
Manufacturer:	Epson
Available From:	Epson Canada
Suggested Retail:	$2995.00

Expander

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	5 1/4" or 8" floppy
Screen Format:	80x24
Graphics:	80x72 pixels with colour
Sound:	Yes
Colour:	Yes; 256 colours standard
Keyboard:	Integrated
Software Included:	CP/M
Primary Market:	Business
Manufacturer:	California Computer Systems
Available From:	Orion Electronic Supplies
Suggested Retail:	$1000.00

GRiD Compass

Operating System:	GRiD-OS
Processor(s):	8086 and 8087
RAM:	256K RAM, 384K bubble memory
Printer I/O:	IEEE, two serial; 1200/300 baud modem included
Disk Drives Inc:	Optional floppy or hard disks
Screen Format:	Up to 80x24
Graphics:	320x240 pixels
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	GRiDPlan/Write/Print/Plot/File
Weight:	10 lbs.
Primary Market:	Business
Manufacturer:	GRiD Systems Corporation
Available From:	Local dealers
Suggested Retail:	$6295.00

HAL

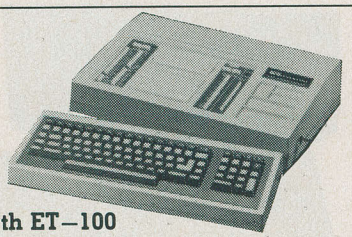
Operating System:	N/A
Processor(s):	8088
RAM:	128K
Printer I/O:	One serial and one parallel
Disk Drives Inc:	One half-height 320K DS DD 5¼" floppy
Screen Format:	40/80x25
Graphics:	640x320 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	HAL Computer Company
Available From:	HAL Computer Company
Suggested Retail:	$2119.00
Other:	Full IBM PC compatibility with PROM purchase

HS-151

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel, IBM compatible slots
Disk Drives Inc:	One or two 5¼" DS DD floppy
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS, diagnostic software
Primary Market:	Business/hobbyist
Manufacturer:	Heath/Zenith
Available From:	Heathkit Electronics Centre
Suggested Retail:	Kits: $2799.00 (one drive), $3199.00 (two drives)
Other:	Assembled: $3999.00 (one drive), $4659.00 (two drives)

HS-161

Similar to the HS-151 but includes a 9" amber monitor. No list price available.



Heath ET-100

Operating System:	Assembler, editor and debugger
Processor(s):	8088
RAM:	16K
Printer I/O:	One serial, one programmable parallel
Disk Drives Inc:	Cassette based; disk upgrade available
Screen Format:	40x20 or 80x24
Graphics:	33 graphic characters
Sound:	Yes
Colour:	Optional upgrade
Keyboard:	Detachable
Software Included:	CP/M assembler, editor and debugger
Primary Market:	Hobbyist and education
Manufacturer:	Heathkit
Available From:	Heathkit
Suggested Retail:	$2000.00
Other:	Available in kit or assembled form

Heath H-100

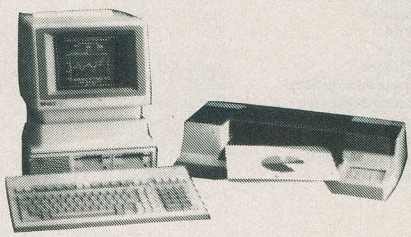
Operating System:	Choice
Processor(s):	8088 and 8085
RAM:	192K
Printer I/O:	Two serial and one parallel
Disk Drives Inc:	1 DS DD 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x225 pixels
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	CP/M or ZDOS
Primary Market:	Business
Manufacturer:	Heathkit
Available From:	Heathkit
Suggested Retail:	$3300.00; $3500.00 with integrated monitor
Other:	Kit version of Zenith Z-100

HiTECH

Operating System:	BASIC and CP/M
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Two SS SD 5¼" floppy
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business or home
Manufacturer:	HiTECH
Available From:	HiTECH Computer Systems
Suggested Retail:	$595.00
Other:	Apple][+ and Apple CP/M compatible

HP Series 200 Model 16

Operating System:	Optional
Processor(s):	68000
RAM:	128K
Printer I/O:	Serial and IEEE
Disk Drives Inc:	N/A
Screen Format:	80x25
Graphics:	300x400 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Choice of BASIC, HPL or Pascal
Primary Market:	Business
Manufacturer:	Hewlett Packard
Available From:	NSN Options, DSA
Suggested Retail:	$6259.50



HP 150 Touchscreen

Operating System:	MS-DOS, HP Touch
Processor(s):	8088
RAM:	256K
Printer I/O:	Two serial, one IEEE-488
Disk Drives Inc:	Optional floppy or hard drives
Screen Format:	80x24
Graphics:	512x390 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	MS-DOS, P.A.M.
Primary Market:	Business
Manufacturer:	Hewlett Packard
Available From:	NSN Options
Suggested Retail:	$5200.00

EXPOTEK

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All Models ..... **Call**

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EXP 500 ..... **349**
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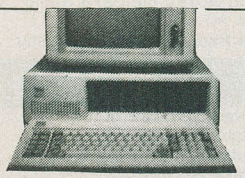
Hyperion

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Two 5 1/4" DS DD
Screen Format:	80x25
Graphics:	640x250 pixels
Sound:	Programmable
Colour:	No
Keyboard:	Detachable
Software Included:	In:Scribe, Multiplan
Weight:	9.6 kg.
Primary Market:	Business
Manufacturer:	Bytec-Comterm
Available From:	Computerland
Suggested Retail:	$4950.00

IBM Portable

Operating System:	MS-DOS, PC-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	Five expansion slots
Disk Drives Inc:	One 5 1/4" DS DD floppy
Screen Format:	40/80x25
Graphics:	650x200 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Operating systems
Primary Market:	Business
Manufacturer:	International Business Machines
Available From:	Local dealers
Suggested Retail:	$4099.00

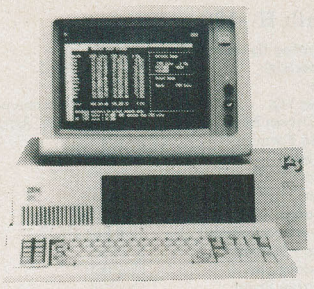


IBM PC

Operating System:	PC DOS, UCSD p-System and CP/M-86
Processor(s):	8088
RAM:	256K
Printer I/O:	Expansion slots
Disk Drives Inc:	One 360K drive
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Operating systems
Primary Market:	Business
Manufacturer:	International Business Machines
Available From:	Local dealers
Suggested Retail:	$3149.00
Other:	Optional auxiliary storage with expansion unit

IBM PCjr

Operating System:	DOS 2.1 (enhanced model), Cassette BASIC
Processor(s):	8088
RAM:	64K; 128K enhanced
Printer I/O:	Serial
Disk Drives Inc:	Optional DS 5 1/4" floppy; One 320K floppy (enhanced model)
Screen Format:	40x24
Graphics:	N/A
Sound:	Yes
Colour:	Yes
Keyboard:	Detached; infra red link
Software Included:	BASIC; DOS 2.1 (with enhanced model)
Primary Market:	Home
Manufacturer:	International Business Machines
Available From:	Local Dealers
Suggested Retail:	$998.00 entry level; $1569.00 enhanced
Other:	Compatible with over 30 IBM PC programs



IBM XT

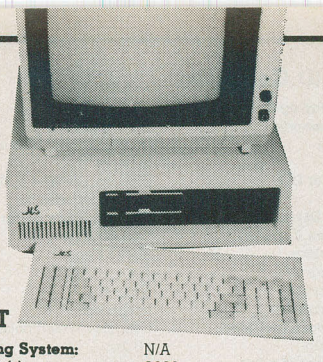
Operating System:	PC-DOS, UCSD p-System, CP/M-86
Processor(s):	8088
RAM:	256K
Printer I/O:	Expansion slots
Disk Drives Inc:	One 5 1/4" floppy, one 10 Mb hard drive
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Operating systems
Primary Market:	Business
Manufacturer:	International Business Machines
Available From:	Local Dealers
Suggested Retail:	$6849.00

Infinity 8800

Operating System:	BASIC
Processor(s):	6502 and Z80
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional slim-line 5¼" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business/home
Manufacturer:	Infinite Canada Inc.
Available From:	Infinite Canada Inc.
Suggested Retail:	$719.00
Other:	10 user-defined keys (5 year memory). 188 function keys

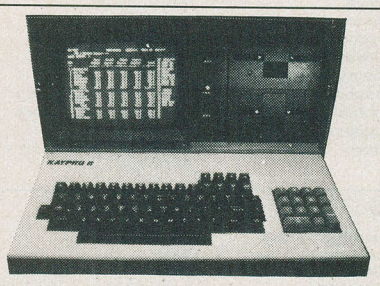
Intertec Superbrain II Jr

Operating System:	DOS and CP/M
Processor(s):	Twin Z80As
RAM:	64K
Printer I/O:	Two serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	CP/M, DOS, BASIC
Primary Market:	Business
Manufacturer:	Intertec Data Systems
Available From:	E.M.J. Data Systems
Suggested Retail:	$3595.00



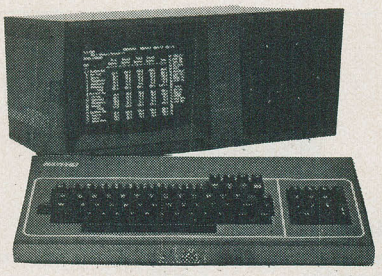
JLS XT

Operating System:	N/A
Processor(s):	8088
RAM:	64K
Printer I/O:	Eight slots
Disk Drives Inc:	N/A
Screen Format:	80x24
Graphics:	N/A
Sound:	Yes
Colour:	N/A
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	JLS Electronics
Available From:	JLS Electronics
Suggested Retail:	$1499.00
Other:	IBM compatible. 130 watt power supply



Kaypro II

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial and parallel
Disk Drives Inc.:	Two 5 1/4" SS DD
Screen Format:	80x24
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Perfect Writer, Profit Plan
Weight:	26 lbs.
Primary Market:	Business
Manufacturer:	Kaypro
Available From:	Micro Bazzar
Suggested Retail:	$2095.00

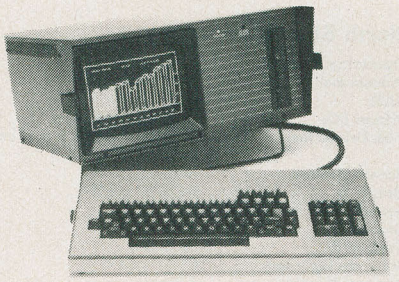


Kaypro 4

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial and parallel
Disk Drives Inc.:	Two 5 1/4" DS DD
Screen Format:	80x24
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Uniform Software
Weight:	26 lbs.
Primary Market:	Business
Manufacturer:	Kaypro
Available From:	Micro Bazzar
Suggested Retail:	$3055.00

Kaypro 4 Plus 88

Operating System:	CP/M, MS-DOS
Processor(s):	Z80A, 8088
RAM:	320K
Printer I/O:	N/A
Disk Drives Inc:	N/A
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Same as Kaypro II
Primary Market:	Business
Manufacturer:	Kaypro
Available From:	Micro Bazzar
Suggested Retail:	$3695.00



Kaypro 10

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	One 5 1/4" DS DD floppy, one 10 Mb hard
Screen Format:	80x24
Graphics:	100x160 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M, WordStar, The Word Plus, MicroPlan, MailMerge, InfoStar, CalcStar, more...
Primary Market:	Business
Manufacturer:	Kaypro
Available From:	Micro Bazzar
Suggested Retail:	$4395.00

Laser 3000

Operating System:	Microsoft BASIC
Processor(s):	6502; optional 8088 and Z80
RAM:	64K
Printer I/O:	One parallel; optional serial
Disk Drives Inc:	Optional 5¼" floppys
Screen Format:	40/80x24
Graphics:	560x192
Sound:	Four channels, six octaves
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC; filer diskette with drive purchase
Primary Market:	Business/home
Manufacturer:	Video Technology Ltd.
Available From:	Combitron Microsystems Inc.
Suggested Retail:	$963.00; $1595 for two drive system

The Link

Operating System:	SNAP
Processor(s):	6502
RAM:	8K
Printer I/O:	Peripheral connector
Disk Drives Inc.:	8 or 16K RAM modules
Screen Format:	26 character LCD
Graphics:	159x8
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	
Software Available:	Panasonic software
Weight:	620 grams
Primary Market:	Business
Manufacturer:	Matsushita
Available From:	Panasonic
Suggested Retail:	$549.00
Other:	Built-in rechargeable batteries

Micro 48

Operating System:	BASIC
Processor(s):	6502
RAM:	48K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business or home
Manufacturer:	N/A
Available From:	Gladstone Electronics
Suggested Retail:	$499.95
Other:	Apple compatible

Micro Professor

Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	One parallel
Disk Drives Inc.:	Optional
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business
Manufacturer:	Multitech Ind. Corp.
Available From:	Polytech
Suggested Retail:	$340.00 including keyboard, CPU and power supply

Morrow Micro Decision MD3

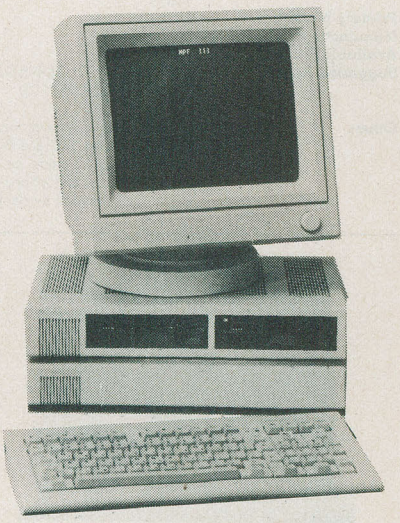
Operating System:	CP/M 2.2
Processor(s):	Z80
RAM:	64K
Printer I/O:	Two serial
Disk Drives Inc:	720K floppy disk
Screen Format:	80x24
Graphics:	N/A
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Word processor, speller, spreadsheet, more
Primary Market:	Business
Manufacturer:	Morrow
Available From:	Micro Bazzar
Suggested Retail:	$2995.00
Other:	Three programming languages included

Morrow MD3P

Operating System:	CP/M 2.2, Microsoft BASIC
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Two 5 1/4" DS DD floppy drives
Screen Format:	80x24
Graphics:	60 graphics characters
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	New Word, Correct It, Logicalc, Personal Pearl data base
Software Available:	Extensive
Weight:	24 lbs.
Primary Market:	Business
Manufacturer:	Morrow
Available From:	Micro Bazzar
Suggested Retail:	$2950.00

Morrow MD11

Operating System:	CP/M 3.0
Processor(s):	Z80A
RAM:	128K
Printer I/O:	One parallel, three serial
Disk Drives Inc:	One 5 1/4' floppy, one 11 megabyte hard
Screen Format:	80x25
Graphics:	N/A
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	NewWord, Correct-it, Personal Pearl Database, SuperCalc 2, Quest, MBase, PILOT
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Morrow
Available From:	Micro Bazzar
Suggested Retail:	$4395.00



MPF III

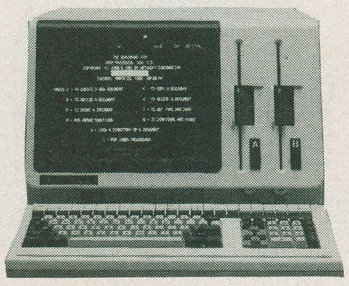
Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes; 36 tone sound chip
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Primary Market:	Business or home
Manufacturer:	Multitech
Available From:	Micro Computech
Suggested Retail:	$1350.00
Other:	Price includes green phosphor monitor

Multiflex

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	One parallel, 2 optional serial
Disk Drives Inc:	One 5 1/4" floppy
Screen Format:	80x24
Graphics:	50 graphics characters
Sound:	No
Colour:	No
Keyboard:	Purchased separately
Software Included:	CP/M
Primary Market:	Hobbyist
Manufacturer:	Multiflex
Available From:	Exceltronics
Suggested Retail:	$1195.00; $995.00 kit
Other:	Includes EPROM programmer

NCR PC Computer

Operating System:	CP/M
Processor(s):	Z80
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two floppy or one floppy, one hard
Screen Format:	80x24
Graphics:	640x400 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	BASIC, financial and word processor
Primary Market:	Business
Manufacturer:	NCR
Available From:	SVG Marketing
Suggested Retail:	$3895.00 (0102); $6895.00 (0103); $4495.00 (1102); $7250.00 (1103)
Other:	0103 model has a hard disk, 1102 model has Z80 and 8088 processors, 1103 model has both processors and a hard drive. Other models available.



NEC Advanced Personal Computer

Operating System:	CP/M, MS-DOS
Processor(s):	8086
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One or two 8" floppy
Screen Format:	80x25
Graphics:	640x475 pixels display window
Sound:	Yes
Colour:	Optional
Keyboard:	Detached
Software Included:	CP/M and MS-DOS
Primary Market:	Business
Manufacturer:	NEC
Available From:	Microcomputers of Canada, Inc.
Suggested Retail:	$4195.00 1 drive; $5195.00 2 drives
Other:	$6395.00 with colour

NEC PC-8201

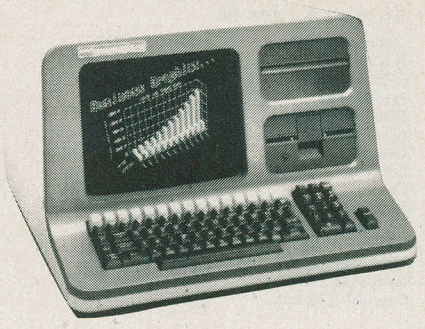
Operating System:	Proprietary
Processor(s):	80C85
RAM:	16K
Printer I/O:	Parallel
Disk Drives Inc.:	No
Screen Format:	40x8 LCD
Graphics:	Block
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	Textfiles, Telecom
Weight:	4.0 lbs.
Primary Market:	Business
Manufacturer:	NEC
Available From:	Microcomputers of Canada
Suggested Retail:	$850.00

NEC PC 8801

Operating System:	BASIC
Processor(s):	PD780C-1; Z80 compatible
RAM:	64K
Printer I/O:	Parallel and serial
Disk Drives Inc:	5 1/4" and 8" floppy interfaces
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	Two BASICs
Primary Market:	Business
Manufacturer:	NEC
Available From:	Microcomputers of Canada
Suggested Retail:	$1995.00

Nelma Persona

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial and one parallel
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	WordStar, CalcStar, comm. software
Primary Market:	Business
Manufacturer:	Nelma Data Corporation
Available From:	Nelma Data Corporation
Suggested Retail:	$2395.00 for single sided, single density
Other:	Ten megabyte hard drive with 128K RAM and CP/M Plus. Also available is a double sided, double density disk drive. For these prices contact Nelma Data Corporation.

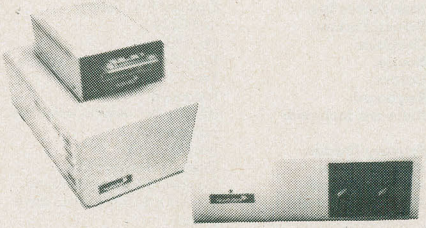


North Star Advantage

Operating System:	CP/M or DOS
Processor(s):	Z80A; optional 8088
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two floppy or one floppy, one hard
Screen Format:	80x24
Graphics:	640x240 pixels
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	CP/M or DOS
Primary Market:	Business
Manufacturer:	North Star
Available From:	TRW Data Systems
Suggested Retail:	$3695.00 for 2 floppys
Other:	Systems with hard drives start at $7495.00

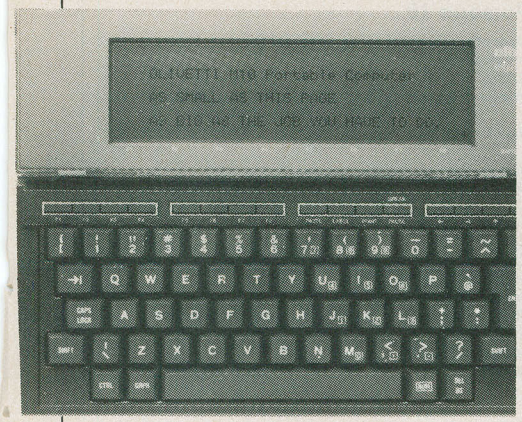
North Star Dimension

Operating System:	N/A
Processor(s):	80186
RAM:	256K
Printer I/O:	One parallel, two serial, 13 slots
Disk Drives Inc:	One 360K floppy; hard drives available
Screen Format:	N/A
Graphics:	N/A
Sound:	No
Colour:	N/A
Keyboard:	N/A
Software Included:	N/A
Primary Market:	Business
Manufacturer:	North Star Computers, Inc.
Available From:	TRW Data Systems
Suggested Retail:	$10995.00
Other:	Up to 12 users



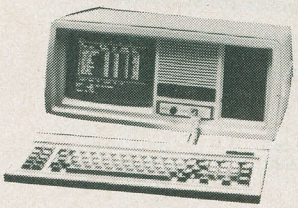
North Star Horizon

Operating System:	Choice
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial, one parallel, S100
Disk Drives Inc:	One floppy, one hard
Screen Format:	N/A
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	N/A
Software Included:	CP/M or DOS, or Multi-user TSS, TSS/C
Primary Market:	Business
Manufacturer:	North Star
Available From:	TRW Data Systems
Suggested Retail:	$15Mb $8195.00
Other:	30Mb $9695.00



Olivetti M10 Portable

Operating System:	MS
Processor(s):	80C85
RAM:	8-32K
Printer I/O:	Serial and parallel
Disk Drives Inc:	N/A
Screen Format:	40x8
Graphics:	Yes
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	MS BASIC, Text Processing, Telcom, Addrss, Schedl
Primary Market:	Business, education
Manufacturer:	Kyocera
Available From:	Olivetti branches and dealers
Suggested Retail:	$999.00

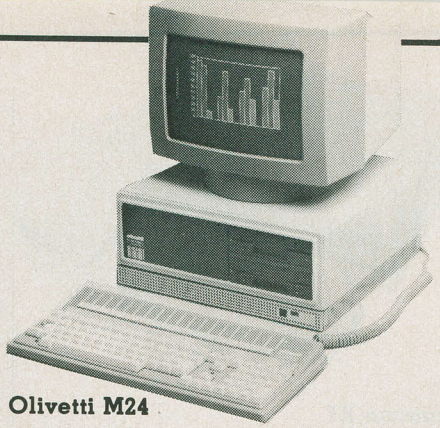


Olivetti M-18 Portable

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	One half-height 5 1/4" DS DD
Screen Format:	80x25
Graphics:	640x325 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	GW BASIC, MultiMate, PC Tutor, MS-DOS
Weight:	28 lbs.
Primary Market:	Business
Manufacturer:	Corona
Available From:	Olivetti branches and dealers
Suggested Retail:	$3596.00; $3695.00 desktop model; both models $6295 with 10 Mb hard disk
Other:	Shock mounted disk drives

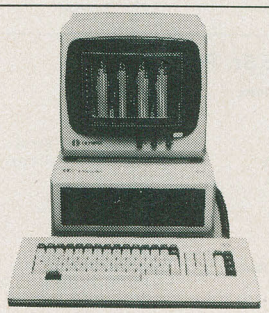
Olivetti M21 Portable

Operating System:	MS-DOS
Processor(s):	8086
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One half-height 5 1/4" floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	MS-DOS, GW BASIC
Primary Market:	Business
Manufacturer:	Olivetti
Available From:	Olivetti branches and dealers
Suggested Retail:	N/A
Other:	IBM compatible; optional second 5 1/4" floppy



Olivetti M24

Operating System:	MS-DOS
Processor(s):	8086
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One half-height 5 1/4" floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS, GW BASIC
Primary Market:	Business
Manufacturer:	Olivetti
Available From:	Olivetti branches and dealers
Suggested Retail:	$4445.00
Other:	IBM compatible; optional second floppy or 10 Mb hard disk



Olympia People

Operating System:	CP/M and MS-DOS
Processor(s):	8086
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two floppy drives
Screen Format:	80x25
Graphics:	600x485 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	WordStar, SuperCalc, dBASE II
Primary Market:	Home or business
Manufacturer:	Olympia International
Available From:	Olympia Business Machines Canada Limited
Suggested Retail:	$4950.00

Orion 0412

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial; two expansion ports
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional card; 1024x678 pixels B&W
Sound:	No
Colour:	Optional card; 640x480 pixels colour
Keyboard:	Detachable
Software Included:	CP/M
Primary Market:	Business
Manufacturer:	DY-4 Systems, Inc.
Available From:	DY-4 Systems, Inc.
Suggested Retail:	$3244.00
Other:	Multi-user capabilities

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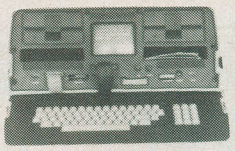
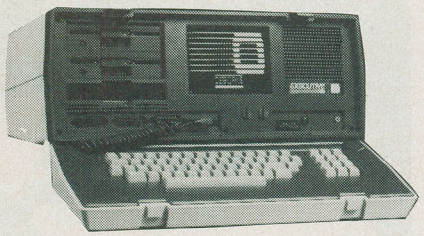


Osborne 1

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	52x24
Graphics:	Graphic characters in ROM
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	WordStar, MailMerge, SuperCalc, more
Primary Market:	Business
Manufacturer:	Osborne Canada
Available From:	Lanpar
Suggested Retail:	$1395.00

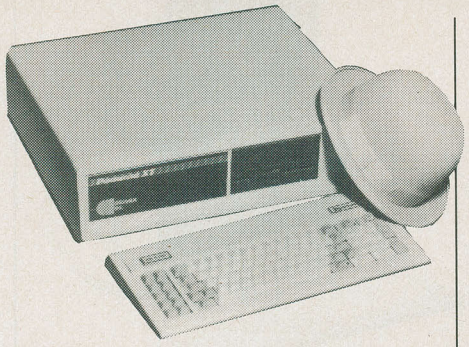


Osborne Executive

Operating System:	CP/M and UCSD p-System
Processor(s):	Z80A
RAM:	128K
Printer I/O:	Two serial
Disk Drives Inc.:	Two 5 1/4" SS SD drives
Screen Format:	80x24
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	WordStar, MailMerge, SuperCalc, Personal Pearl
Weight:	23 1/2 lbs.
Primary Market:	Business
Manufacturer:	Osborne Canada
Available From:	Lanpar
Suggested Retail:	$2395.00

Otrona 2001

Operating System:	MS-DOS
Processor(s):	8088; optional Z80B and 8087
RAM:	128K
Printer I/O:	One serial and one parallel
Disk Drives Inc:	Two DS DD 5¼" floppy
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Operating system
Primary Market:	Business
Manufacturer:	Otrona Advanced Systems Corp.
Available From:	Scarsdale 500
Suggested Retail:	$4495.00
Other:	7" flat screen, portable



Panama XT

Operating System:	Optional; MS-DOS or CP/M-86
Processor(s):	8088
RAM:	64K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	One half-height 5¼" floppy; optional hard drive
Screen Format:	40/80x24
Graphics:	640x320 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detached; also has French characters
Software Included:	BIOS in ROM
Primary Market:	Business
Manufacturer:	Ogivar Inc.
Available From:	Ogivar Inc., local dealers
Suggested Retail:	$4700.00
Other:	'Mouse' included

Panasonic Sr. Partner

Operating System:	MS-DOS 2.11
Processor(s):	8088
RAM:	128K
Printer I/O:	One parallel, one serial
Disk Drives Inc:	One DS DD 5¼" floppy
Screen Format:	80x25
Graphics:	Yes
Sound:	N/A
Colour:	Optional
Keyboard:	Detachable
Software Included:	WordStar, VisiCalc, pfs:File/Report/Graph, GW BASIC
Primary Market:	Business
Manufacturer:	Panasonic
Available From:	Panasonic
Suggested Retail:	N/A
Other:	Built-in printer, disk drive and expansion space.

Peach IV

Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	128K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business or home
Manufacturer:	Peach Microsystems
Available From:	Peach Microsystems
Suggested Retail:	$1249.00
Other:	Disk controller on board

Peach Executive

Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	128K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	N/A
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Primary Market:	Business
Manufacturer:	Peach Microsystems
Available From:	Peach Microsystems
Suggested Retail:	$1449.00

Persona 16

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K, expandable to 512K
Printer I/O:	One serial, one parallel and an optional 2nd serial
Disk Drives Inc:	2Two 5 1/4" double density disk drives
Screen Format:	80x25
Graphics:	Colour 600x200 pixels, monochrome 720x350 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	MS-DOS
Primary Market:	Business
Manufacturer:	Nelma Data Corporation
Available From:	Nelma Data Corporation
Suggested Retail:	$3995.00
Other:	Clock with rechargable battery backup. IBM software and hardware compatible.

Philips PC

Operating System:	MS-DOS 1.25
Processor(s):	8088
RAM:	128K
Printer I/O:	Parallel and serial
Disk Drives Inc:	Two 5¼" floppy
Screen Format:	40/80x25
Graphics:	640x325 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Multi-Mate, GW BASIC, PC Tutor, MS-DOS
Primary Market:	Business
Manufacturer:	Corona
Available From:	Philips Information Systems
Suggested Retail:	$3665.00; 256K version running MS-DOS 2.0 is $3990.00
Other:	Four expansion slots. Monitor included.

Pied Piper

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Parallel
Disk Drives Inc:	One 5 1/4' floppy
Screen Format:	80x24
Graphics:	10 graphics characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	Perfect Writer/Speller/Filer/Calc
Weight:	12.5 lbs.
Primary Market:	Home or business
Manufacturer:	Semi-Tech Microelectronics
Available From:	Semi-tech Microelectronics
Suggested Retail:	$1799.00

Almost Free PC Software

Our Almost Free Software disks, volumes one through three, for systems running CP/M have been so thunderingly popular that we have assembled a volume for IBM PC users. The considerably greater power of a sixteen bit system, coupled with its larger capacity disk drives, have enabled us to offer a collection of programs that will knock the socks off virtually any sentient life form booting the disk. Be warned... wear sandals when you unwrap this thing.

This software will run superbly on genuine IBM PC's and compatible systems.

PC-WRITE While not quite Wordstar for nothing, this package comes extremely close to equalling the power of commercial word processors costing five or six bills. It has full screen editing, cursor movement with the cursor mover keypad, help screens and all the features of the expensive trolls.

SOLFE This is a small BASIC program that plays baroque music. While it has little practical use, it's just a kick to toodle with. It's also a fabulous tutorial on how to use BASICA's sound statements.

PC-TALK Telecommunications packages for the IBM PC are typically intricate, powerful and huge. This one is no exception. It has menus for everything and allows full control of all its parameters, even the really silly ones. It does file transfers in both ASCII dump and MODEM7/X-MODEM protocols and comes with... get this... 119424 bytes of documentation.

SD This sorted directory program produces displays which are a lot more readable than those spewed out by typing DIR. It's essential to the continued maintenance of civilization as we know it.

FORTH This is a small FORTH in Microsoft BASIC. It's good if you want to get used to the ideas and concepts of FORTH... you can build on the primitives integral with the language.

LIFE This is an implementation of the classic ecology game written in 8088 assembler. While you may grow tired of watching the cells chewing on each other, in time the source will provide you with a powerful example of how to write code.

MAGDALEN This is another BASIC music program. We couldn't decide which of the two we've included here was the best trip, so we wound up putting them both on the disk. Ah... the joys of double sided drives.

CASHACC This is a fairly sophisticated cash acquisition and limited accounting package written in BASIC. It isn't exactly BPI, but it's a lot less expensive and suitable for use in most small business applications.

DATAFILE This is a simple data base manager written in... yes, trusty Microsoft BASIC.

UNWS Wordstar has this unusual propensity for setting the high order bits on some of the characters in the files it creates. Looks pretty weird when you try to do something other than Wordstar the file, doesn't it... Here's a utility to strip the bits and "unWordstar" the text. The assembler source for this one is provided.

HOST2 This is a package including the BASIC source and a DOC file to allow users with Smart-Modems to access their PC's remotely. It's a hacker's delight.

The disk also includes various support and documentation files needed to run the software.

We can provide the Almost Free PC Software Disk volume one on either one standard double sided disk or on two single sided ones.† The cost for the double sided package is:

Only

$16.95

† or $19.95 for two single sided disks.

The Computing Now! Almost Free PC Software Disk #1
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Or telephone your order to (416) 423-3262 using VISA, American Express or Mastercard.

Fine print:
There has to be fine print sooner or later, or the typesetting machine forgets how to do it. All of the software on the Almost Free PC Software Disk #1 has been obtained through public access bulletin boards and is believed to be in the public domain. Some of it is "freeware", and users will find messages imbedded in the code asking for donations on the part of the authors. This is between you and your conscience... hit RETURN and it usually goes away.

This software is offered free of charge. The cost of this package serves only to defer the cost of postage, handling and the disk itself.

Moorshead Publications warrants that the software will be readable. If defects in the medium prevent this, we will replace your disk at no cost. While we have made every effort to assure that these programs are completely debugged, we are unable to assist you in adapting them for your application.

Pied Piper Professional

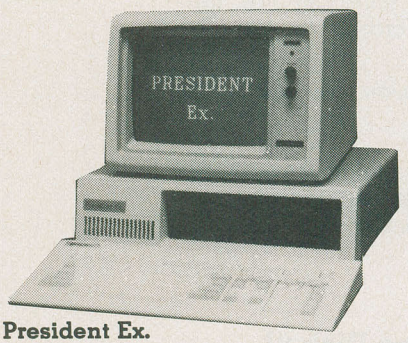
Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	10 graphics characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	CBASIC, Perfect software, terminal package
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Semi-Tech Microelectronics
Available From:	Semi-Tech Microelectronics and local dealers
Suggested Retail:	$2775.00
Other:	Monitor stand included

The Portable

Operating System:	MS-DOS, P.A.M.
Processor(s):	8086
RAM:	272K
Printer I/O:	One serial, one HP-IL
Disk Drives Inc:	RAM disk; optional 710K 3½" floppy
Screen Format:	80x16 LCD
Graphics:	480x128 pixels
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	Lotus 1-2-3, MS-DOS, P.A.M., WP, terminal
Primary Market:	Business
Manufacturer:	Hewlett-Packard
Available From:	Hewlett-Packard
Suggested Retail:	$4598.00

The President

Operating System:	Optional; MS-DOS or CP/M-86
Processor(s):	8088
RAM:	128K
Printer I/O:	One serial
Disk Drives Inc:	Two slimline 5 1/4' floppy
Screen Format:	40/80x24
Graphics:	640x320 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business or Home
Manufacturer:	President Computer Corp.
Available From:	President Computer Corp.
Suggested Retail:	$3195.00
Other:	High resolution monochrome monitor included



President Ex.

Operating System:	N/A
Processor(s):	8088
RAM:	256K
Printer I/O:	Two serial and two parallel
Disk Drives Inc:	One 20 Mb hard, one 1.6 Mb 5 1/4" floppy, one 360K 5 1/4" floppy
Screen Format:	40/80x25
Graphics:	720x348
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	President Computer Corp.
Available From:	President Computer Corp.
Suggested Retail:	$7945.00
Other:	256K extra RAM on multi-function card.

President Sr.

Operating System:	N/A
Processor(s):	8088
RAM:	256K
Printer I/O:	Two serial and two parallel
Disk Drives Inc:	One 10 Mb hard disk and two 5 1/4" floppy; one DS DD and one DS QD
Screen Format:	40/80x25
Graphics:	720x348 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	President Computer Corp.
Available From:	President Computer Corp.
Suggested Retail:	$5495.00
Other:	Real-time clock/calendar

Pronto 16/10

Operating System:	MS-DOS
Processor(s):	80186
RAM:	128K
Printer I/O:	2 serial, 1 parallel, 4 expansion ports
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x25
Graphics:	Optional 640x480 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	BASIC, word processor, spreadsheet, more
Primary Market:	Business
Manufacturer:	Pronto Computers, USA
Available From:	Local dealers
Suggested Retail:	$2995.00

QCAL 500

Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Cassette interface; optional 5¼" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home or business
Manufacturer:	QCAL International
Available From:	Pacific Rim Electronic Imports
Suggested Retail:	$549.00
Other:	Apple compatible

QCAL 900

Operating System:	BASIC or CP/M
Processor(s):	6502 and Z80
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5¼" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business or home
Manufacturer:	QCAL International
Available From:	Pacific Rim Electronic Imports
Suggested Retail:	$699.00
Other:	94 function keys

QCAL 1000

Operating System:	BASIC or CP/M
Processor(s):	6502 and Z80
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional dual 5¼" slimline floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Primary Market:	Business or home
Manufacturer:	QCAL International
Available From:	Pacific Rim Electronic Imports
Suggested Retail:	$849.00
Other:	188 function keys; user defined keys

QCAL 8000

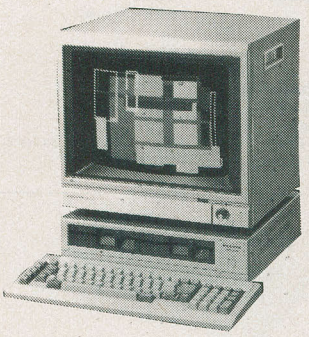
Operating System:	N/A
Processor(s):	8088
RAM:	128K
Printer I/O:	Five expansion slots
Disk Drives Inc:	One DS DD 5¼" floppy
Screen Format:	40/80x25
Graphics:	N/A
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	QCAL International
Available From:	Pacific Rim Electronic Imports
Suggested Retail:	$2295.00

Radio Shack PC-4

Operating System:	BASIC
Processor(s):	Proprietary
RAM:	5K
Printer I/O:	Optional
Disk Drives Inc:	Optional cassette
Screen Format:	12 character LCD
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business or home
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$99.95

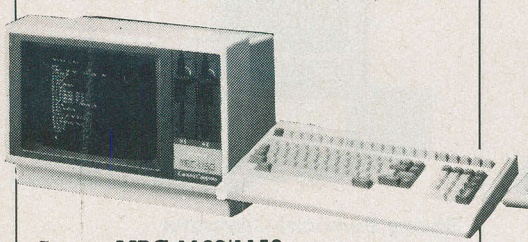
Robie

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial, one parallel, one phone jack
Disk Drives Inc:	Two 2.6 Mb 5 1/4" floppy
Screen Format:	80x25
Graphics:	100x160 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M, BASICs, The Word Plus, WordStar, MicroPlan, SuprTerm, MailMerge, InfoStar, more...
Primary Market:	Business
Manufacturer:	Kaypro
Available From:	Micro Bazzar
Suggested Retail:	$2295.00
Other:	Built-in 300 baud auto-answer, auto-dial modem



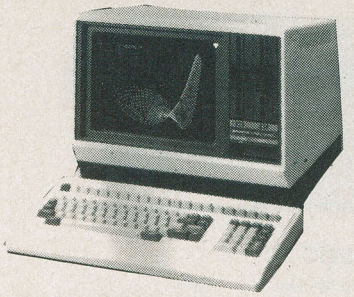
Sanyo MBC 550/555

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Optional serial
Disk Drives Inc:	One 160K 5" floppy (550) or two (555)
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC, MS-DOS
Primary Market:	Home or business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$1495.00 (550); $1995.00 (550)
Other:	With 360K drives, the 550-2 and 555-2 are $1795.00 and $2495.00 respectively.



Sanyo MBC 1100/1150

Operating System:	CP/M 2.2
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Parallel and serial
Disk Drives Inc:	One 5 1/4" floppy (1100) or two (1150)
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M 2.2 and BASIC
Primary Market:	Business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$2595.00 (1100 model)
Other:	$3195.00 (1150 model)

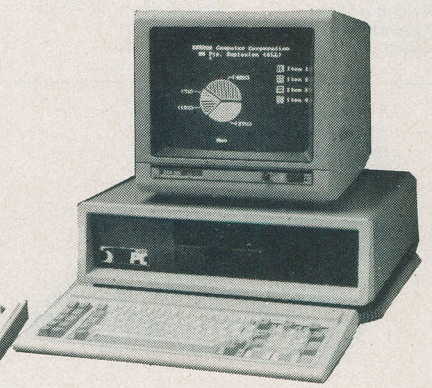


Sanyo MBC 1200/1250

Operating System:	CP/M 2.2
Processor(s):	Two Z80A, one 8048 (keyboard)
RAM:	64K
Printer I/O:	Parallel and serial
Disk Drives Inc:	One DS DD 5 1/4" floppy (1200) or two (1250)
Screen Format:	80x33/40
Graphics:	640x400 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M and BASIC
Primary Market:	Business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$3195.00 (1200 model)
Other:	$3995.00 (1250 model)

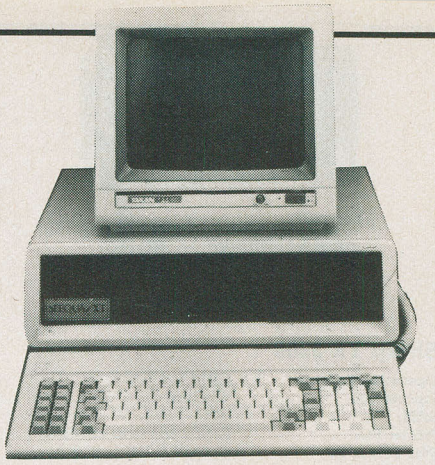
Sanyo 4000/4050

Operating System:	CP/M-86
Processor(s):	8086 and 8048 (keyboard)
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One 5 1/4" DSDD floppy (4000) or two (4050)
Screen Format:	80x25
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M-86 and BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$3795.00 (4000 model)
Other:	$4795.00 (4050 model)



Seequa PC

Operating System:	MS-DOS 1.25 or CP/M 80
Processor(s):	8088 and Z80
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One DS DD 5¼" floppy
Screen Format:	40/80x25
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Same as Chameleon
Primary Market:	Business
Manufacturer:	Seequa Computer Corporation
Available From:	Local Dealers
Suggested Retail:	$1995.00
Other:	9" monitor



Seequa XT

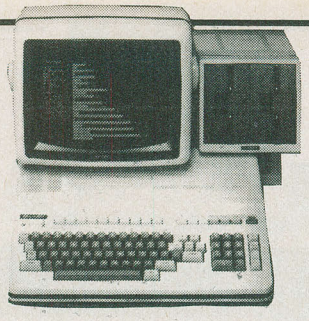
Operating System:	MS-DOS 2.0 or CP/M 80
Processor(s):	Z80 and 8088
RAM:	256K
Printer I/O:	Serial and parallel; four expansion slots
Disk Drives Inc:	One DS DD 5¼" floppy, one 10 Mb hard drive
Screen Format:	80x24
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Same as Chameleon Plus
Primary Market:	Business
Manufacturer:	Seequa
Available From:	York Computers
Suggested Retail:	$5500.00
Other:	9" monitor

Sharp PC 1500

Operating System:	BASIC
Processor(s):	C-MOS
RAM:	2.6K
Printer I/O:	Optional printer/cassette interface
Disk Drives Inc:	Optional printer/cassette interface
Screen Format:	26x1 LCD
Graphics:	7x156 pixels
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home or business
Manufacturer:	Sharp
Available From:	Total Office Systems
Suggested Retail:	$299.95
Other:	Battery operated

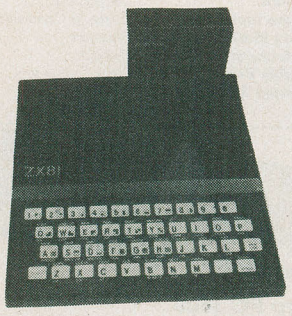
Sharp PC 5000

Operating System:	MS-DOS
Processor(s):	8088 and C-MOS
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc.:	Opt. 128K bubble cartridge
Screen Format:	80x8 LCD
Graphics:	640x80 pixels
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	N/A
Weight:	5 kg.
Primary Market:	Business
Manufacturer:	Sharp Electronics
Available From:	Total Office Systems
Suggested Retail:	$2695.00, not including printer and drive



Sharp YX 3200

Operating System:	CP/M and FDOS
Processor(s):	YX-3200
RAM:	64K
Printer I/O:	Parallel and serial expansion
Disk Drives Inc:	Optional 5 1/4" or 8" floppy
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	Two BASICs
Primary Market:	Home or Business
Manufacturer:	Sharp
Available From:	Total Office Systems
Suggested Retail:	$2395.00



Sinclair ZX-81

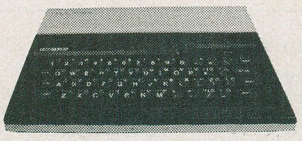
Operating System:	BASIC
Processor(s):	Z80
RAM:	1K
Printer I/O:	Expansion port for ZX-Printer
Disk Drives Inc:	Cassette based
Screen Format:	32x16
Graphics:	32 graphic characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Sinclair
Available From:	Gladstone Electronics
Suggested Retail:	$49.95
Other:	Original version of T/S 1000

Solution 5000 PC

Operating System:	MS-DOS 2.11
Processor(s):	8088
RAM:	128K; 256K for portable model
Printer I/O:	One serial, one parallel, 5 slots
Disk Drives Inc:	Two 360K DS DD 5¼" floppy
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS, Electric Pencil, K.I.S. Accounting, future packages free of charge
Primary Market:	Business
Manufacturer:	Ace Micro-Electronics Corporation
Available From:	Ace Micro-Electronics Corporation
Suggested Retail:	Prices start at $2495.00
Other:	One year warranty

Sony SMC-70

Operating System:	CP/M
Processor(s)	Z80A
RAM	64K
Printer I/O	Serial, parallel, five expansion ports
Disk Drives Inc:	Optional SS DD 3 1/2" floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	CP/M
Primary Market:	Business
Manufacturer:	Sony
Available From:	Sony Canada Ltd.
Suggested Retail:	$1895.00 base price
Other:	Single drive $2790; dual drive $3390

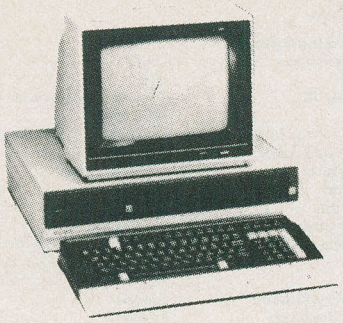


Sord M5

Operating System:	BASIC
Processor(s):	Z80A
RAM:	20K
Printer I/O:	Parallel
Disk Drives Inc:	Optional cassette
Screen Format:	40x24 (TV)
Graphics:	N/A
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Sord
Available From:	Micos Computer Systems Inc.
Suggested Retail:	$331.00
Other:	Sprite graphics

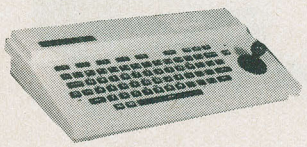
Sord M23P

Operating System:	CP/M S, P, and three expansion slots
Disk Drives Inc.:	Two 3 1/2" floppy drives
Screen Format:	80x8 LCD
Graphics:	640x64
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	Spreadsheet
Software Available:	Extensive
Weight:	9 kg.
Primary Market:	Business
Manufacturer:	Sord
Available From:	Micos Computer Systems Inc.
Suggested Retail:	$3259.00



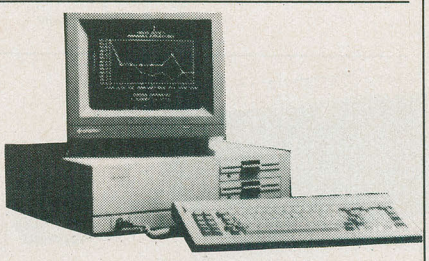
Sord M68

Operating System:	N/A
Processor(s):	MC68000, Z80A
RAM:	256K
Printer I/O:	Two serial, parallel, IEEE bus
Disk Drives Inc:	Two 5" mini floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	Sord
Available From:	Micos Computer Systems, Inc.
Suggested Retail:	$7294.00



Spectravideo SV-318

Operating System:	BASIC
Processor(s):	Z80A
RAM:	32K
Printer I/O:	Expansion bus
Disk Drives Inc:	Cassette driven; optional floppy
Screen Format:	40x24
Graphics:	256x192; 32 sprites
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	Spectravideo
Available From:	Spectravideo
Suggested Retail:	$399.00 with data cassette and software
Other:	Integrated joystick



Sperry Personal Computer

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc:	One or two 5 1/4" floppy or 10 mb hard
Screen Format:	40/80x25
Graphics:	320x200, 320x400, 640x200 or 640x400 pixels
Sound:	No
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS
Primary Market:	Business
Manufacturer:	Sperry Inc.
Available From:	Sperry Inc.
Suggested Retail:	$3970.00
Other:	Five configurations available

Spectravideo SV-328

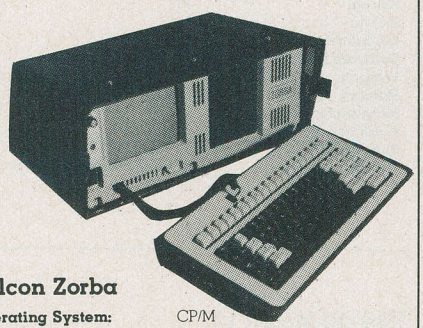
Operating System:	Microsoft BASIC
Processor(s):	Z80A
RAM:	80K
Printer I/O:	Optional expander available
Disk Drives Inc:	Cassette driven. Optional 5¼" floppy
Screen Format:	40x24. Optional 80 column cartridge
Graphics:	256x192 pixels; 32 sprites
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home/business
Manufacturer:	Spectravideo
Available From:	Spectravideo Canada
Suggested Retail:	$599.00
Other:	CP/M compatible

STM Personal Computer

Operating System:	MS-DOS 2.11
Processor(s):	80186 (8 MHz)
RAM:	256K
Printer I/O:	One parallel, two serial. Integrated printer.
Disk Drives Inc:	Two 720K (formatted) DS DD 5¼" drives
Screen Format:	80x25 LCD
Graphics:	640x200 pixels colour, 720x348 pixels monochrome
Sound:	Yes; hands-free telephone
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS, telephone/modem support
Primary Market:	Business
Manufacturer:	Semi-Tech Microelectronics Corporation
Available From:	Local dealers
Suggested Retail:	$3699.00
Other:	Integrated auto-dial/auto-answer modem, RGB/composite output

TAVA PC

Operating System:	N/A
Processor(s):	8088
RAM:	64K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	One 5¼" floppy
Screen Format:	40/80x25
Graphics:	640x320 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Business
Manufacturer:	TAVA Canada Inc.
Available From:	Nielsen Computers Inc.
Suggested Retail:	$2995.00
Other:	Monitor included

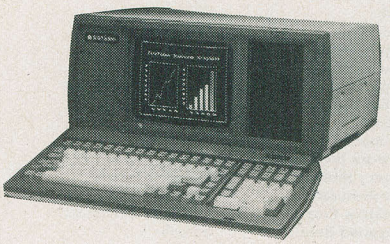


Telcon Zorba

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	IEEE, parallel and serial
Disk Drives Inc.:	Two 5 1/4" DS DD drives
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	WordStar, MailMerge, CalcStar
Software Available:	Extensive
Weight:	22 lbs.
Primary Market:	Business
Manufacturer:	Telecon Ind. Inc.
Available From:	Micro Bazzar
Suggested Retail:	$2995.00
Other:	Full and half intensity monitor

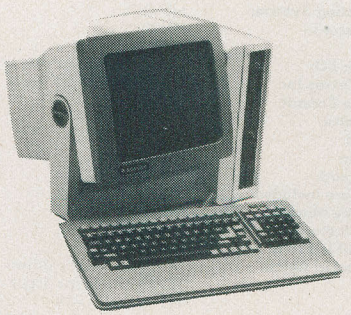
Telcon Zorba

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	IEEE, parallel and serial
Disk Drives Inc.:	Two 5 1/4" DS DD drives
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	WordStar, MailMerge, CalcStar
Weight:	22 lbs.
Primary Market:	Business
Manufacturer:	Telecon Ind. Inc.
Available From:	Micro Bazzar
Suggested Retail:	$2995.00
Other:	Full and half intensity monitor



Televideo TPC 1

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc.:	One 5 1/4" floppy drive
Screen Format:	80x24
Graphics:	640x240 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	GSX-80 Graphics, word processing, spreadsheet
Weight:	25 lbs.
Primary Market:	Business
Manufacturer:	Televideo
Available From:	Datamex
Suggested Retail:	$3200.00 (2 drives)



Televideo TS 803

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x240 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M
Primary Market:	Business
Manufacturer:	Televideo
Available From:	Datamex
Suggested Retail:	$3704.00
Other:	TS 803H (One floppy, one 10 Mb hard) $5936.00

Televideo TS 1603

Operating System:	CP/M
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M-86 and MMM Ost
Software Included:	Extensive
Primary Market:	Business
Manufacturer:	Televideo
Available From:	Datamex
Suggested Retail:	$4420.00

TEO Tiger 4000

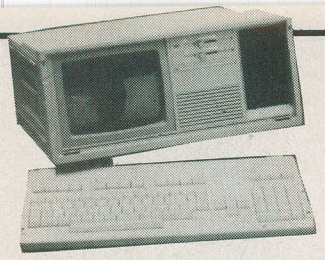
Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy or cassette
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	Spreadsheet, word processor
Primary Market:	Home or business
Manufacturer:	TEO Computers
Available From:	TEO Computers
Suggested Retail:	$1595.00
Other:	Apple compatible

TEO Tiger Personal

Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Two 5 1/4' floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Primary Market:	Home or Business
Manufacturer:	TEO Computers
Available From:	TEO Computers
Suggested Retail:	$1595.00
Other:	Apple compatible

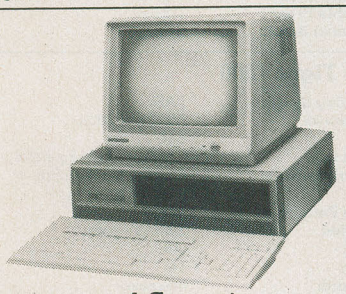
TEO TPC 8300

Operating System:	BASIC
Processor(s):	CMOS
RAM:	6K
Printer I/O:	Parallel
Disk Drives Inc:	Printer/plotter/cassette interface available
Screen Format:	48x2 LCD
Graphics:	255 graphic characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	Extended Pocket BASIC
Primary Market:	Business
Manufacturer:	TEO Computers
Available From:	TEO Computers
Suggested Retail:	$449.00
Other:	Portable; battery or adapter powered



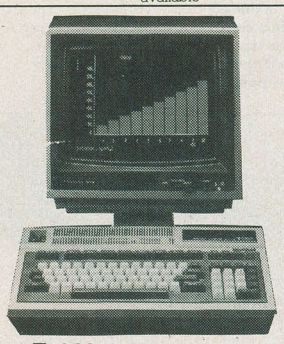
Texas Instruments Portable

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	One half-height 5 1/4" floppy
Screen Format:	80x25
Graphics:	720x300 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	MS-DOS
Weight:	29 lbs.
Primary Market:	Business
Manufacturer:	Texas Instruments
Available From:	Texas Instruments
Suggested Retail:	$3475.00



TI Professional Computer

Operating System:	Choice of MS-DOS, CP/M-80, CP/M-86, UCSD
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial, five expansion ports
Disk Drives Inc:	One 5 1/4" floppy
Screen Format:	80x25
Graphics:	720x300 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	Variable
Primary Market:	Business
Manufacturer:	Texas Instruments
Available From:	Authorized dealers
Suggested Retail:	$3445.00
Other:	Voice management system available



Toshiba T-100

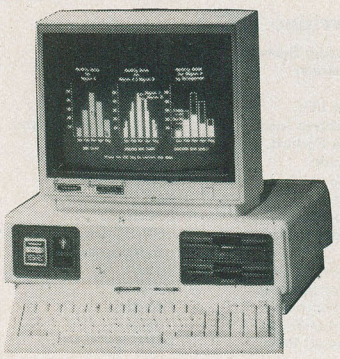
Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two 5 1/4" DS DD floppy
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	Two BASICs, spreadsheet, word processor and data base
Primary Market:	Business
Manufacturer:	Toshiba
Available From:	Irwin Electronics
Suggested Retail:	$2500.00

Toshiba T-300

Operating System:	MS-DOS
Processor(s):	8088
RAM:	192K; expandable to 512K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	One 5 1/4" DD floppy
Screen Format:	80x25
Graphics:	640x500 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	MS-DOS and TBASIC
Primary Market:	Business
Manufacturer:	Toshiba
Available From:	Irwin Electronics, Infinite Canada Inc.
Suggested Retail:	$3500.00
Other:	Programmable function keys

Timex Sinclair 1000

Operating System:	BASIC
Processor(s):	Z80
RAM:	2K
Printer I/O:	ZX Printer interface
Disk Drives Inc:	Cassette based
Screen Format:	32x16
Graphics:	32 graphic characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Timex
Available From:	Gladstone Electronics
Suggested Retail:	$54.95



TRS-80 2000

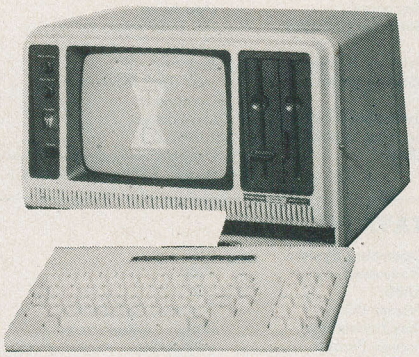
Operating System:	MS-DOS
Processor(s):	80186
RAM:	128K
Printer I/O:	Serial; 4 expansion slots
Disk Drives Inc:	Two slimline 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x400 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$4150.00 2 floppy drives; $6399.00 with one floppy drive and one hard drive
Other:	Processor operates at 8 MHz

TRS-80 Color Computer

Operating System:	BASIC
Processor(s):	6809E
RAM:	16K
Printer I/O:	Serial
Disk Drives Inc:	Optional disk drives or cassette
Screen Format:	32x16
Graphics:	256x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Home
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$189.95
Other:	249.95 with Extended BASIC

TRS-80 Model 4

Operating System:	TRSDOS
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Parallel
Disk Drives Inc:	Two SS DD 5 1/4' floppy
Screen Format:	80x24
Graphics:	Optional 640x240 pixels
Sound:	Programmable
Colour:	No
Keyboard:	Integrated
Software Included:	TRSDOS, BASIC
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$1999.00

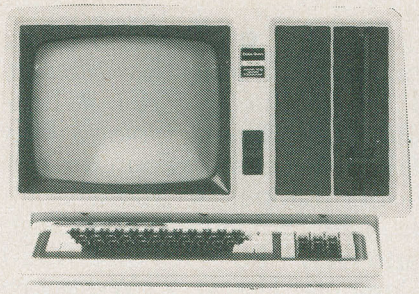


TRS-80 Model 4P

Operating System:	Microsoft 5.0, TRSDOS 6.0
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Parallel
Disk Drives Inc.:	Two 5 1/4" floppy drives
Screen Format:	80x24
Graphics:	Optional 640x240 pixel graphics
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Operating systems
Weight:	25 lbs.
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$1999.00
Other:	Model III and Model 4 compatible

TRS-80 Model 12

Operating System:	TRS-DOS
Processor(s):	Z80
RAM:	80K
Printer I/O:	Two serial and two parallel
Disk Drives Inc:	Two DS DD 8" floppy
Screen Format:	40/80x24
Graphics:	32 business graphics characters
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	TRS-DOS, BASIC
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$5199.00
Other:	Bilingual version $300.00 extra



TRS Model 16B

Operating System:	TRS-XENIX
Processor(s):	Z80A and MC68000
RAM:	256K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	One 1.25 Mb 8" floppy, one 15 Mb hard
Screen Format:	80x24
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	TRS-XENIX
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$9399.00
Other:	Multi-user capabilities

TRS-80 Model 100

Operating System:	Extended BASIC
Processor(s):	80C85
RAM:	8K
Printer I/O:	Parallel
Disk Drives Inc.:	No
Screen Format:	40 char. x 8 line LCD
Graphics:	Yes
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	N/A
Weight:	3.9 lbs.
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$799.99; 24K versiom $1099.00
Other:	Built-in modem with auto-dialer

TS 1605 Personal Computer

Operating System:	TeleDOS
Processor(s):	8088
RAM:	128K
Printer I/O:	One parallel, one serial
Disk Drives Inc:	Two slim-line DS DD 5¼" floppy
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	No
Colour:	Yes
Keyboard:	Detached
Software Included:	TeleDOS, TeleBASIC
Primary Market:	Business
Manufacturer:	Televideo
Available From:	Norango Computer Systems Inc.
Suggested Retail:	$2995.00 base

UR Portabrain

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial and parallel
Disk Drives Inc:	5 1/4" floppy, 192K RAM disk
Screen Format:	N/A
Graphics:	N/A
Sound:	N/A
Colour:	N/A
Keyboard:	N/A
Software Included:	CP/M and Communications package
Primary Market:	Business
Manufacturer:	Universal Research
Available From:	Micro Bazzar
Suggested Retail:	$1895.00
Other:	Portable

Winner

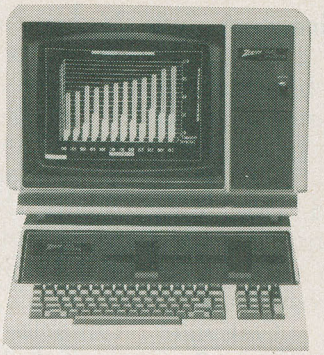
Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	76K
Printer I/O:	Serial
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Primary Market:	Business or home
Manufacturer:	Orion
Available From:	Orion Electronics
Suggested Retail:	$995.00
Other:	Function keys; CP/M and Apple compatible

Xerox 16/8 Prof. Comp.

Operating System:	Supports CP/M-80, CP/M-86 and MS-DOS
Processor(s):	8086 and Z80A
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Optional 2 floppy or 1 hard, 1 floppy
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	BASIC
Primary Market:	Business
Manufacturer:	Xerox
Available From:	Xerox Stores
Suggested Retail:	$5595.00 SS drives; $6795.00 DS drives
Other:	$8995.00 with rigid disk

Xerox 1810

Operating System:	CP/M
Processor(s):	Proprietary
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Cassette built-in
Screen Format:	80x3
Graphics:	Yes
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	Text Editor, electronic mail
Weight:	5 lbs.
Primary Market:	Business
Manufacturer:	Xerox
Available From:	The Xerox Store
Suggested Retail:	$2495.00
Other:	Built-in modem, clock, calendar

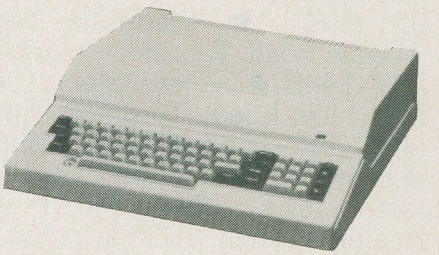


Zenith Z-100

Operating System:	Choice
Processor(s):	8088 and 8085
RAM:	128K
Printer I/O:	Two serial and one parallel
Disk Drives Inc:	One DS DD 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x225 pixels
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	CP/M or ZDOS
Primary Market:	Business
Manufacturer:	Zenith
Available From:	Local dealers
Suggested Retail:	$4395.00 (no monitor); $5295.00 (2 drives)
Other:	$5450.00 with two drives and monitor

Zenith Z—160

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	One or two 5¼" DS DD floppy
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	MS-DOS, diagnostics
Primary Market:	Business
Manufacturer:	Heath/Zenith
Available From:	Heathkit-Zenith
Suggested Retail:	N/A



Zeus 2001

Operating System:	Variable
Processor(s):	6502
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5¼" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	Variable; user's choice
Primary Market:	Business or home
Manufacturer:	Arcomp Micro Systems
Available From:	Chen Koll Enterprises
Suggested Retail:	$429.00
Other:	Needs system card

Addresses: Ace Micro-Electronics Corporation, 106-11511 Bridgeport Road, Richmond, British Columbia V6X 1T4 (604) 276-8214 ● Anderson-Jacobson Canada Limited, 32 Don Mills Road, Markham, Ontario L3R 1C2 (416) 475-5510 ● Apple Canada, 875 Don Mills Road, Don Mills, Ontario M3C 1V9 ● Astris Science Inc., 318 Pinehurst Drive, Oakville, Ontario L6J 4X5 (416) 844-4522 ● Bee Microsystems, Suite 211, 277 Lakeshore Road East, Oakville, Ontario L6J 1H9 (416) 845-3609 ● Chen Koll Enterprises Limited, 3987 Chesswood Drive, Downsview, Ontario M3J 2R8 (416) 636-2116 ● CDI Computer Distribution Incorporated, 311 West 1st Street, North Vancouver, British Columbia V7M 1B5 (604) 984-0641 ● Combitron Microsystems Inc., 1294 Algoma Road, Ottawa, Ontario K1B 3W6 (613) 748-9821 ● Commodore Computer, 3370 Pharmacy Avenue, Agincourt, Ontario M1W 2K4 ● ComputerLand, 3761 Victoria Park Avenue, #5, Scarborough, Ontario M1W 2S6 (416) 497-5722 ● Datacalc Technology Industries Corporation, 224 Slater Road, Cranbrook, British Columbia (604) 489-5343 ● Datamex, 14 Leswin Road, Toronto, Ontario M6A 1K2 (416) 781-9135 ● DataTech Systems Limited, 135-5665 Kingsway, Burnaby, British Columbia V5H 2G4 (604) 437-3751 ● Digital Equipment Company, 165 Attwell Drive, Rexdale, Ontario M9W 595 (416) 675-2580 ● DY-4 Systems Inc., 888 Lady Ellen Place, Ottawa, Ontario K1Z 5M1 (613) 728-3711 ● EMJ Data Systems, 291 Woodlawn West, Unit 3, Guelph, Ontario N1H 7L6 (519) 837-2444 ● Epson Canada, 285 Yorkland Boulevard, Willowdale, Ontario M2J 1S5 (416) 495-9955 ● Exceltronix Inc., 319 College Street, Toronto, Ontario M5T 1S2 (416) 921-8941 ● Gladstone Electronics, 1736 Avenue Road, Toronto, Ontario M5M 3Y7 (416) 787-1448 ● GRiD Systems Canada, Inc., 895 Don Mills Road, Toronto, Ontario M3C 1W3 (416) 446-1555 ● HAL Computer Company, 296 Brunswick Avenue, Suite 201, Toronto, Ontario M5S 2M7 (416) 453-2001 ● Heathkit-Zenith, 1020 Islington Avenue, Toronto, Ontario M8Z 5X5 (416) 231-4171 ● Hewlett-Packard, 6877 Goreway Drive, Mississauga, Ontario L4V 1M8 (416) 678-9340 ● HiTECH Computer Systems, 4648-99th Street, Edmonton, Alberta T6E 5H5 (403) 437-0196 ● IBM Canada Limited, 3500 Steeles Avenue East, Markham, Ontario L3R 2Z1 (416) 474-2053 ● Irwin Electronics, 165 North Queen Street, Etobicoke, Ontario M9C 1A7 (416) 626-6600 ● Infinite Canada, Inc., 785 Plymouth, Suite 123, Mont-Royal, Quebec H4P 1B3 (514) 342-6454 ● JLS Electronics, 151 Yonge Street, 2nd Floor, Toronto, Ontario M5C 1W4 (416) 362-7985 ● Kobetek Systems Limited, 1113 Commercial Street, New Mineas, Nova Scotia B4N 3E6 (902) 678-7771 ● Lanpar, 85 Torbay Road, Markham, Ontario L3R 1G7 (416) 475-9123 ● Leading Source (Division of Lanpar) - See Lanpar ● Micos Computer Systems Inc., 1295 Eglinton Avenue East, Mississauga, Ontario L4W 3E6 (416) 624-0320 ● Micro Bazzar Computer House, 23 Westmore Drive, #5, Rexdale, Ontario M9V 3Y7 (416) 745-4740 ● Micro Computech Electronics Limited, 535 Queen Street West, Toronto, Ontario M5V 2B4 (416) 864-0332 ● Micro Computers of Canada Inc., 3410 Midland Avenue, Unit #4, Scarborough, Ontario M1V 2N1 (416) 293-3885 ● Neilsen Computers, Inc., 275 Lancaster Street West, Kitchener, Ontario N2H 4V2 (519) 743-1830 ● Nelma Data Corporation, 5170-A Timberlea, Cooksville, Ontario (416) 624-0334 ● Norango Computer Systems Inc., 2025 Sheppard Avenue East, Willowdale, Ontario M2J 1V7 (416) 498-5332 ● NSN Options Limited, 250 Wyecroft Road, Unit 11, Oakville, Ontario L6K 3T7 (416) 842-6530 ● Office Equipment, 525 Denison, Markham, Ontario (416) 491-9330 ● Ogivar Inc., 958 Montee de Liesse, Ville St. Laurent, Quebec H4T 1N8 (514) 334-3642 ● Olivetti Canada Limited, 1390 Don Mills Road, Don Mills, Ontario M3B 2X3 (416) 447-3351 ● Olympia Business Machines Canada Limited, 58 Prince Andrew Place, Don Mills, Ontario M3C 3A2 (416) 445-4212 ● Orion Electronic Supplies Inc., 40 Lancaster Street West, Kitchener, Ontario N2H 4S9 (519) 576-9902 ● Pacific Rim Electronic Imports, Inc., 13439-111 Street, Edmonton, Alberta T5E 4Z7 (403) 475-0555 ● Panasonic Office Automation, 5770 Ambler Drive, Mississauga, Ontario L4W 2T3 (416) 624-5010 ● Peach Microsystems, 24 Bayswater Avenue, Ottawa, Ontario K1Y 2E4 ● Peripherals Plus, 350 des Erables, Lachine, Quebec H8S 2P9 (514) 364-5554 ● Philips Information Systems, 1200 Sheppard Avenue East, Willowdale, Ontario M2K 2S5 (416) 494-8111 ● Polytech International Limited, 1262 Don Mills Road, Suite 92, Don Mills, Ontario M3B 2W7 (416) 445-4270 ● Popular Electronic Products, 164 Kenneth Street, Suite 102, Duncan, British Columbia V9L 1N4 (604) 748-3222 ● President Computer Corporation, 540 Gordon Baker Road, Willowdale, Ontario M2H 3B4 (416) 492-1455 ● Radio Shack, 279 Bayview Drive, Barrie, Ontario L4M 4W5 ● Robin Hood Electronics, 20 Strathearn Avenue, Brampton, Ontario L6T 4P7 (416) 791-0025 ● Sanyo Canada Inc., Business Systems Division, 50 Beth Nealson Drive, Toronto, Ontario M4H 1M6 ● Scarsdale

500, 2 Bloor Street East, Toronto, Ontario (416) 923–5000 ● Scarsdale Technologies, Incorporated, 23 Prince Andrew Place, Don Mills, Ontario M3C 2H2 (416) 441–1900 ● SC Time Canada, 3900 Victoria Park Avenue, Willowdale, Ontario M2H 3P3 (416) 496–2221 ● Semi–Tech Microelectronics Corporation, 390 Steelcase Road East, Units 7 and 8, Markham, Ontario L3R 1G2 (416) 475–2670 ● Sharp Electronics of Canada Limited, 116 Galaxy Boulevard, Rexdale, Ontrario M9W 4Y6 (416) 675–7244 ● Sony of Canada Limited, Communications Products Division, 411 Gordon Baker Road, Willowdale, Ontario M2H 2S6 (416) 499–1414 ● Spectravideo Canada, 2913 Lakeshore Boulevard West, Toronto, Ontario M8V 1J3 (416) 252–4550 ● Sperry Inc. Computer Systems, 55 City Centre Drive, Mississauga, Ontario L5B 1M4 (416) 270–3030 ● SGV Marketing, 1520 Trinity Drive, Unit 16, Mississauga, Ontario L5T 1T6 (416) 673–2323 ● TEO Computers and Peripherals, Inc., 275 Steelcase Raod East, Markham, Ontario L3R 1G3 (416) 474–9372 ● Texas Instruments, Inc., 280 Centre Street East, Richmond Hill, Ontario L4C 1B1 (416) 884–9181 ● Total Office Systems Limited, 1050 McNicoll Avenue, Unit 14, Scarborough, Ontario M1W 2L8 (416) 493–3575 ● TRW Data Systems, 270 Yorkland Boulevard, Willowdale, Ontario M2J 1R8 (416) 491–9606 ● Xerox Store, 703 Don Mills Road, Don Mills, Ontario M3C 1S2 ● York Computers, 98 Waverly Road, Suite 1, Toronto, Ontario M4L 3T3 (416) 364–2564

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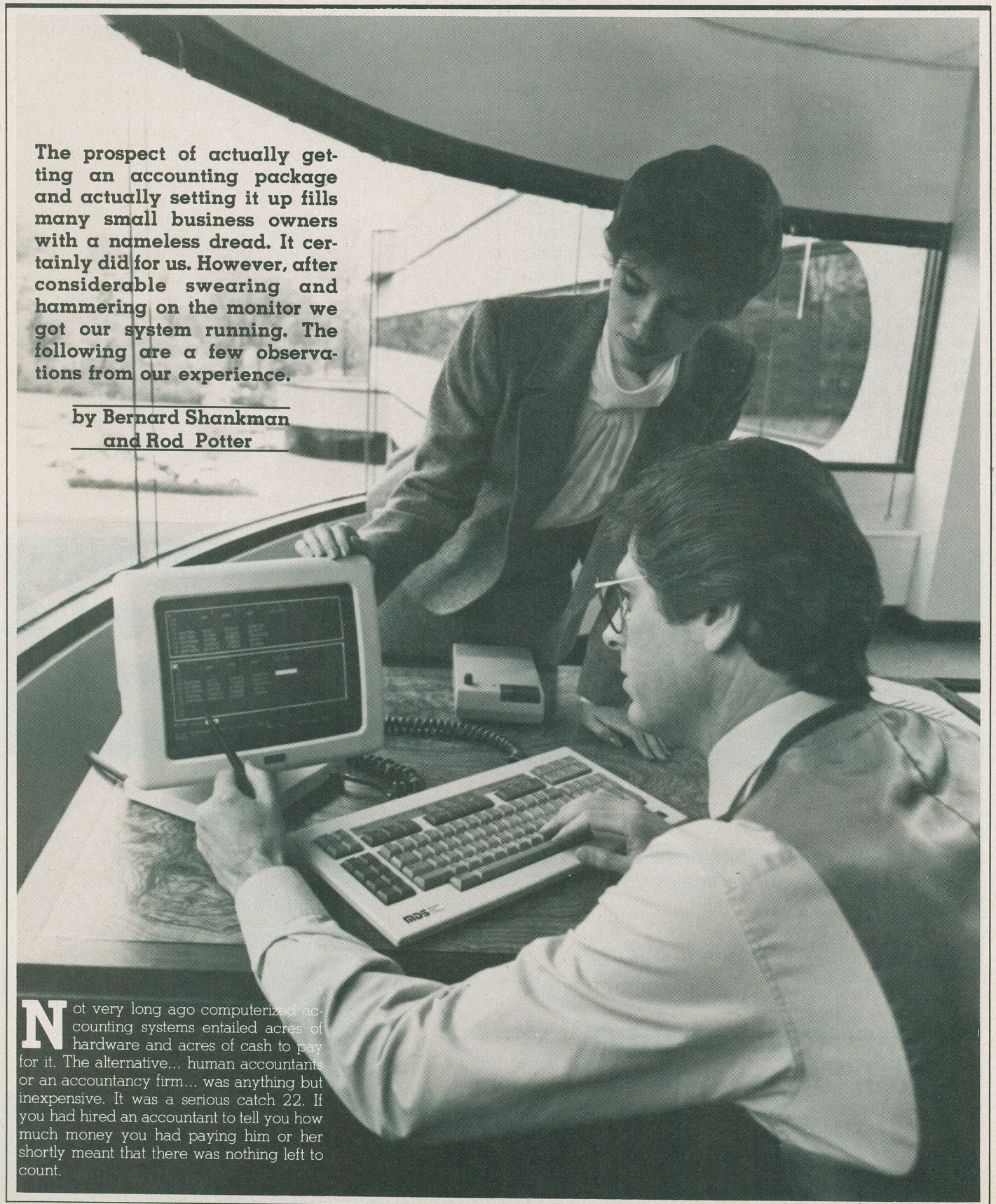
Computerizing the Accounts

The prospect of actually getting an accounting package and actually setting it up fills many small business owners with a nameless dread. It certainly did for us. However, after considerable swearing and hammering on the monitor we got our system running. The following are a few observations from our experience.

by Bernard Shankman and Rod Potter



Not very long ago computerized accounting systems entailed acres of hardware and acres of cash to pay for it. The alternative... human accountants or an accountancy firm... was anything but inexpensive. It was a serious catch 22. If you had hired an accountant to tell you how much money you had paying him or her shortly meant that there was nothing left to count.

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Computerizing the Accounts

The advent of sufficiently powerful microcomputers has changed this. Not only can you buy the machines on time payments but you can get software to run on them that will do all the financial calculations involved with the loan. More to the point, a low cost computer can be made to do the work of several human accountants in many areas of the operation of a small or medium sized business.

Of course, it's not just a matter of buying a few toys and a couple of packages. Implementing an accounting package successfully... that is, so that your books aren't in worse shape than they were when you kept all your receipts in an empty Allen's apple juice can... is among the most difficult things one can undertake with a computer short of trying to understand why it doesn't work.

There is no simple solution to the problem, either... you can't just put the plug back in.

There is now an abundance of software and a host of machines to run it on. If you read a little further you'll be able to add to this some idea of just what's involved in actually marrying the two, and how best to avoid some of the more maddening traps inherent in all computerized accounts.

For Whom the BEL Tolls

There is no formula which dictates whether or not a particular business requires a computerized accounting system. In many small but growing businesses, where the owner is also the manager and accountant... and the janitor... there may well come a time when he or she simply cannot afford to spend the time required to keep the books.

When you are large enough that you don't have time to do your own books, but small enough that you can't afford to hire a full time accountant, a microcomputer system with an appropriate accounting software package may well be a viable option.

You have just read the only simple part of the whole ordeal.

The first aspect of implementing computerized accounts to consider is in finding the right accounting software. This is simply a matter of sifting through the mountain of offerings which are currently available... in much the same way that Michelangelo sculpted David by simply cutting off all the unnecessary bits of rock. There is a great deal to choose from. You will find everything from ultra-specialised packages for retail florists to large, general accounting systems which interface with payroll, inventory and financial spreadsheet programs.

The advantage of a general acftware Dimensions and the *Hardisk Accounting Series* by Great Plains are designed modularly. This does more than just impress the help. A modular design allows one to implement the separate functions of a general accounting package separately... rather than having at the whole chaotic transition from human to computerized accounts in one bash... as well as permitting one or more of the functions to be omitted if it isn't required.

The *Accounting Plus* package, for example, consists of seven modules. The general ledger module is the heart of the system. It keeps track of current financial information as well as prior year and budget information. It will also organise information from the other modules and produce financial statements.

You may have to repeat this procedure several hundred or several thousand times depending upon the current thickness of your manual ledgers.

The other modules include accounts payable, accounts receivable, inventory control, purchase order, sales order and payroll. The beauty of the system is that apart from the general ledger you need buy only the modules that you will use.

From a logistical point of view, the acquisition of an accounting system involves several steps. When the software has arrived and is plugged into the system, all assets, liabilities and other numbers accountants love to talk about must be entered by keyboard into the system.

For the average business... unless you are starting your company and your computerized accounts system simultaneously... this will represent a huge amount of work. If you are operating a medium sized business with moderately complex accounting procedures you may find that you need a full time employee just to key in the initial backlog of data.

Down To It

As a practical real world example of using an accounting package, the *Accounting Plus* package allows the user to organise and store thirteen different types of accounts in the general ledger. Each account is given a number. Using the software manuals and the screen prompts, it is a simple matter to set up the general ledger accounts. You are asked to enter the account number you have chosen, an account description and the account type. You are then asked if you want to accept, edit or delete what you have just typed.

It is useful to organise the accounts so that the first digit in the account number identifies the type of account. Assets can be assigned numbers in the thousands, expenses in the two thousands, sales in the three thousands, and so on.

The procedure is similar for other modules. In the accounts receivable module you can enter customer names, addresses and phone numbers as well as the amounts of credit limits, current orders, current accounts receivable and the payment due date.

It all sounds fairly straightforward... and it is, except that you may have to repeat this procedure several hundred or several thousand times depending upon the current thickness of your manual ledgers.

You would think that once the system is up and running you could simply file the old ledgers in some dusty corner, to be forgotten by everyone but the auditor. However, during the first two or three months of operation the books should be balanced manually as well as by computer. This will allow the operator to check for data errors, program bugs and to generally get used to the system.

There are a number of things to get used to. A computerized accounting system operates by balancing a basic accounting equation. The basic equation says that assets equal liabilities plus capital. To make this equation balance, any increase in assets must be accompanied by an increase in liabilities or capital. What this means for the user is that all entries must be entered twice.

Not surprisingly, this type of bookkeeping is known as *double entry* accounting. With this type of accounting system, the system will be, and essentially demands to be, balanced at all times. This allows the user to extract a balance sheet, an income statement or a trial balance from the computer at any time. The ability to generate financial reports quickly and accurately gives the user a greater ability to project growth patterns and make informed business decisions.

Where the Money Goes

The owner of a small business will be able to see where the money goes, where it comes from and how much gets lost or wasted in transit.

By creating accounts for such demons as sales adjustments and the cost of goods sold, the business manager can generate reports which detail the costs and benefits of particular facets of his or her business. With a sales adjustments account all returns of merchandise will be recorded and can be reported. If a refund or rebate is given to a customer because of a company mistake, that amount will also be recorded.

Suppose, for example, a customer buys one hundred wotsits at one dollar each. Sometime thereafter the customer discovers that twenty of the wotsits are defective and returns them. Using a manual accounting system you would probably just send the customer an invoice for eighty dollars for eighty wotsits.

With a computer accounting system such as *Accounting Plus,* the twenty dollar adjustment must be recorded. This will eliminate any discrepancy between the amounts entered in the sales account and the amounts actually invoiced.

With the ability to create a report outlining all sales adjustments the business manager will be able to identify and correct many sales and manufacturing problems. However, inherent in this ability is the requirement of the system to have on hand *all* the pertinent data. There is only one way for it to get this... if you're looking at your fingers right now you've guessed right. Accounting software, unlike human beings, cannot extrapolate, fudge missing data or overlook sloppy transactions.

Think of it as a crotchety old man with patience about as long as your thumb nail.

Using the accounts receivable module, the user can generate invoices with a minimal amount of pain and frustration. Since all sales transactions and customer particulars are already stored, it is a relatively simple operation to get invoices printed and mailed on time. Not only can the computer churn them out much faster than humans, it can also print reminders, messages and greetings.

The Safe

As with manual accounting systems, computerized systems can be vulnerable to accidental or malicious tampering and damage. These risks can be greatly reduced with appropriate security measures.

Any accounts package worth its salt will have a password to protect it. If you know the password you can run the software. The password should be changed regularly to make things difficult for a would be saboteur.

While you can't stop a really determined and knowledgeable pirate from getting at your data... any more than you could stop him or her from gaining access to a manual ledger, even if it were to be locked in a desk... most situations don't call for quite this much paranoia. Unless you run an unusually unruly company, you will probably be a lot more concerned with casual tinkering. A password will generally stop this.

Just as important is the necessity of duplicating all important data and storing it in different locations. A weekly and monthly routine of backing up your disks must be adhered to religiously. It will probably be reassuring to know that if business becomes the victim of a fire, a theft or even a local meteor shower you will still be able to reconstruct your records. Keep in mind that the data on a computer disk is considerably more volatile than that kept on paper.

Choosing a computer to run your software on is not nearly so difficult as choosing the software itself. However, if you are fairly new to all of this you may find that there are a number of traps lurking in your corner computer shop... most of them set to spring long after your cheque has cleared and been assimilated by someone else's accounting program.

There are some obvious things one can say about hardware. First of all, you should choose the software you want and then get a computer to run it on. Most of the more powerful accounting systems for medium sized businesses available at the moment run under IBM compatible computers. You'll probably need a hard disk... thus, you'll be after an IBM XT or something similar.

In choosing your computer you can pop for a genuine system... in this case, an authentic IBM. Reality, however, is always the most expensive approach. Compatibles come in all shapes... and prices... from there on down, and what you get will be largely a matter of common sense. You have to trade off the cost of the computer against your potential situation should the thing decide to die... with all your records locked within.

Just like a human accountant, occasionally your system may get sick. It could be a bug in the program... yes, they crop up in even the most expensive packages... a hardware breakdown or both. It goes without saying that an imported system built and distributed on a remote atoll in the South Pacific will probably not have a reputation for prompt service... at least not in this hemisphere.

The initial cost and time required to implement a computerized accounting system may seem quite high... needless to say it will all pay for itself over a few months, especially if you've been sitting up night labouring over your books. Furthermore, although most employees initially resent the intrusion of a computer in time you'll probably find that they'll grow to appreciate the machine. With increased productivity and the elimination of a great deal of mathematical drudgery you will probably experience a more cordial and civilized office atmosphere.

Furthermore, when the printer has finally stopped chattering and everyone has gone back to doing other things... you can play Zaxxon on the system. Now there's a *good* reason to buy a computer. **CN!**

TRS-80 Model II MDM730

If you're using a TRS-80 Model II system under one of the popular CP/M implementations for this powerful machine you'll probably know how nearly impossible it is to get telecommunications software patched for your computer.

There's a good reason for this... the serial I/O facilities of the Model II are weird.

To battle the evil of this awsome negativity, we have created an MDM730 overlay for the Model II which allows users to enjoy the full power of MDM730... plus a few enhancements.

MDM730 is the most powerful CP/M based terminal package available, replete with features too numerous to mention here. For a more detailed description of its capabilities, please see the MDM730 article in the August issue of Computing Now!

This implementation of MDM730 will operate under either Lifeboat or Pickles and Trout CP/M. A selection of MDM utilities is also provided with the disk.

The cost is only **$29.95**

Computing Now! Software
25 Overlea Boulevard, Suite 601
Toronto, Ontario M4H 1B1

Fine Print:
The MDM730 program is available in the public domain, and is offered here free of charge. The charges for this package are for the overlay code generated by Computing Now! and to defer the cost of postage, handling and the medium.

The TRS-80 Model II MDM730 code will be ready to run when you receive it. Moorshead Publications warrants that it will function properly if correctly applied.

Computer Museum

You may well wonder why a technology that's barely old enough to have expired warranties needs a museum. Well, in computer time it took you about three hundred years to read this introduction. We must preserve the past before it's lost to us forever.

by Frank Lenk

What is long, low, rounded futuristically, and covered with glass? What looks like the submarine Seaview washed up on shore? It's... it's...

The Computer Museum of Canada.

Gets you real excited, that, doesn't it... Oh, well, yes, the name could stand to be peppier. Actually, it came close to be something like "Computerium", which perhaps reflects the function of the thing a bit better. However by any name it's a fairly entertaining idea and a really innovative project from one of Canada's youngest computer millionaires.

Abe Schwartz is a co-founder of Polaris Technology of Toronto, a company that started in 1977 on five thousand in borrowed bucks. In August of last year, at the ripe old age of twenty-five, Schwartz sold Polaris to the ballooning Crowntek empire for ten million dollars...count the zeroes. Schwartz is still president and chief executive officer for Polaris, which now employs about a hundred people. The computer museum is a concept he hatched in his copious spare time.

The Museum was officially launched at an impressively lavish press conference early in June.

Anchors Aweigh

"The Computer Museum will be the largest museum in the world dedicated to the display of computer technology," claims Schwartz. The general idea behind it all is to make Canadians more comfortable with technology and its implications. However, Schwartz has, as an initial task, making Canadians comfortable with the idea of a computer museum.

Obviously not one to plan for failure, Schwartz has given his brainchild a running start. The initial press conference was passingly spectacular. The members of the press were greeted by thick dossiers of notes, architects' drawings and glossy photos. A model of the proposed building filled one corner of a room. A computer graphic film strip... from the people who did the computer screen displays in Star Trek III, no

less... helped put everyone in a receptive mood.

Schwartz plans to have funding together by next spring and the Museum ready to open its doors sometime in the middle of 1986. The proposed price tag is some twelve million dollars. Most of this paltry sum is to be solicited from the computer industry. Schwartz wasn't saying how much he's sunk in the project so far, but admitted that it was "in six figures".

The contents of this electronic crystal palace are only partially hinted at by its somewhat mundane sounding title.

There will, of course, be an actual computer museum in there somewhere. That is, there will be exhibits dedicated to tracing the history of the development of computer technology. To put this in perspective, the total exhibit space is planned at forty–five thousand square feet, or about a quarter of the size of the Ontario Science Centre. A third of this "will be devoted to displaying and explaining technology", according to Schwartz. "The rest will be used for the demonstration of computer applications."

The museum will naturally try to highlight Canadian computer accomplishments. It will also attempt to point up some of the social issues relating to computerization. Reference materials, both printed and electronic, will be assembled for public access.

A one thousand seat auditorium will be made available for "the exchange of ideas". Furthermore, a number of smaller meeting rooms will be made available to groups "wishing to meet on technology related issues." These groups will include scientific, professional, educational and business associations. Also included will be clubs, interest groups and that sort of less serious phenomena.

Several types of exhibits are being envisioned for the display areas. "Imagine if you will..." says Schwartz.

Imagine a room sized mock up of a microprocessor chip that you can walk through. There will be robots and computer controlled equipment that visitors can operate and program. And, of course, there will be computers. Envisage a room full of terminals on which visitors can "explore the typical types of software currently being used." Those "still too timid to approach the terminals"... and those squeezed out by the crush... will be able to watch the action on large projection screens.

An entire annex of the Museum building will be dedicated to computer art.

The building design is also a part of the display. A creation of the Matsui Baer Vanstone Freeman architectural firm, the museum building is intended to be "a model for the new generation of intelligent buildings". This means that all of its energy, security, internal communications and office automation will be run by a central computer complex. A scrolling display will encircle the building, announcing museum activities. Each of the exhibits inside will also be monitored by the computer to measure its popularity.

Reality

Schwartz has already assembled an impressive roster of personalities to be the top

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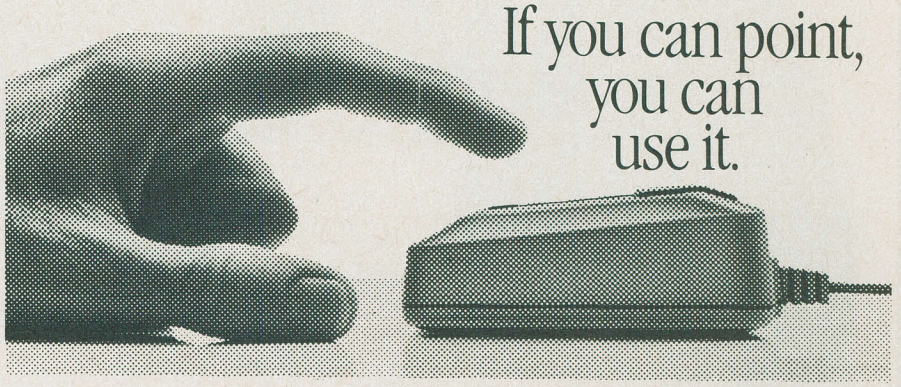

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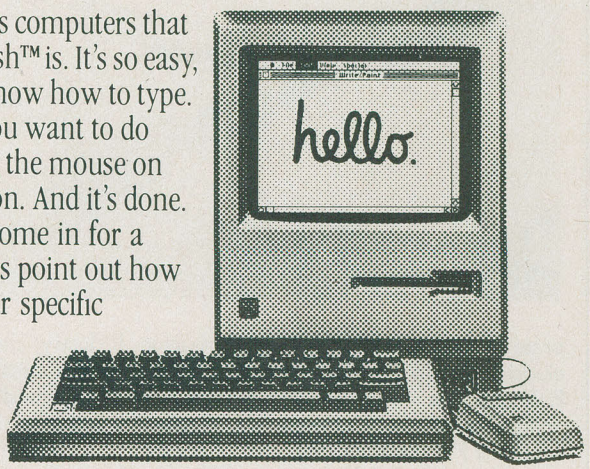

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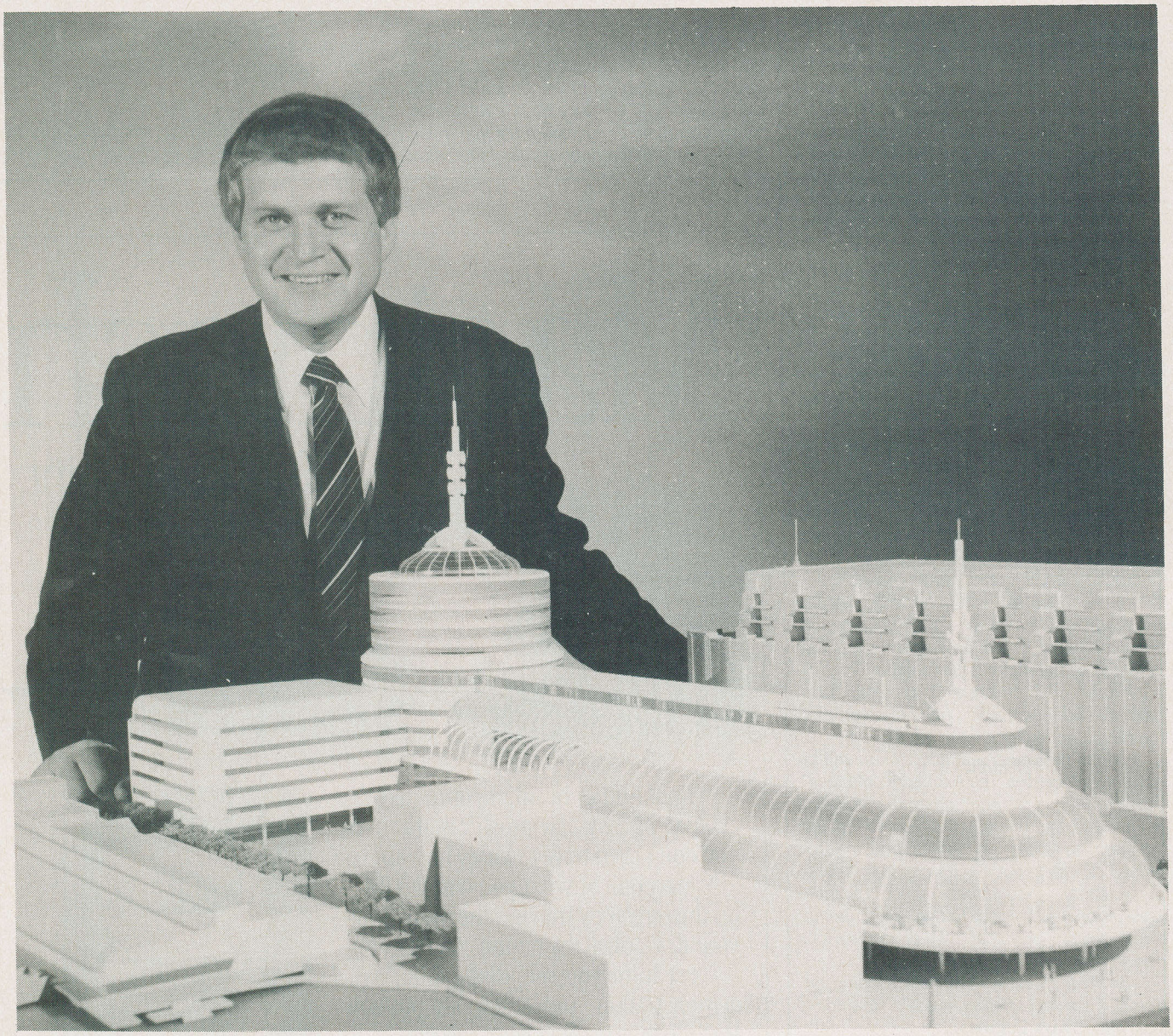
Computer Museum



brass of the museum. This select group includes Senator Keith Davey, Richard Rohmer, the well known author and chancellor of the University of Windsor, Professor J.W. Graham, the director of computer systems at the University of Waterloo, H. Ian Macdonald, the president of York University and of Idea Corporation, Jim Miller, the publisher of Maclean's magazine and others. Schwartz himself will act as the president of the museum.

According to Schwartz, the response from the computer industry in the course of "unofficial talks" thus far has been encouraging. Most of the needed cash should come from within the Canadian computer industry, the faction with the most to gain from promoting the technology. Government funding would only be sought as a last resort.

The other major hurdle is the problem of where to put the thing. The most promising location so far is in Toronto's Harborfront development. The long, narrow museum building could fit nicely between the existing York Quay Centre and Queen's Quay terminal buildings.

The location is not settled yet. However, negotiations are far enough along that all of the architects' drawings and models were based on Harborfront.

A lot of details also need working out, not the least of which is the question of whether or not Toronto is willing to be convinced it really needs a Computer Museum. If the Museum is to be built, there is the question of what place it will take among all the other institutions, such as Harborfront, the Ontario Science Centre and other museums. If the Museum is built at Harborfront one can also consider how will it relate to Harborfront's already successful computer centre. Perhaps most important, how much will it cost to get in?

Schwartz maintains that it will not be more than two bucks.

See you at the grand opening. **CN!**

COMPUTER PRESS

Free PCjr Upgrade

TORONTO, ONTARIO — *IBM Canada Limited* has designed a true typewriter-style **keyboard** for its PCjr model, and is making it available free of charge to current PCjr owners. The new keyboard, also operating by cordless infrared link, has 62 contoured full-travel keys with a standard typewriter-like layout, appearance and touch. This keyboard is now standard on all PCjr systems.

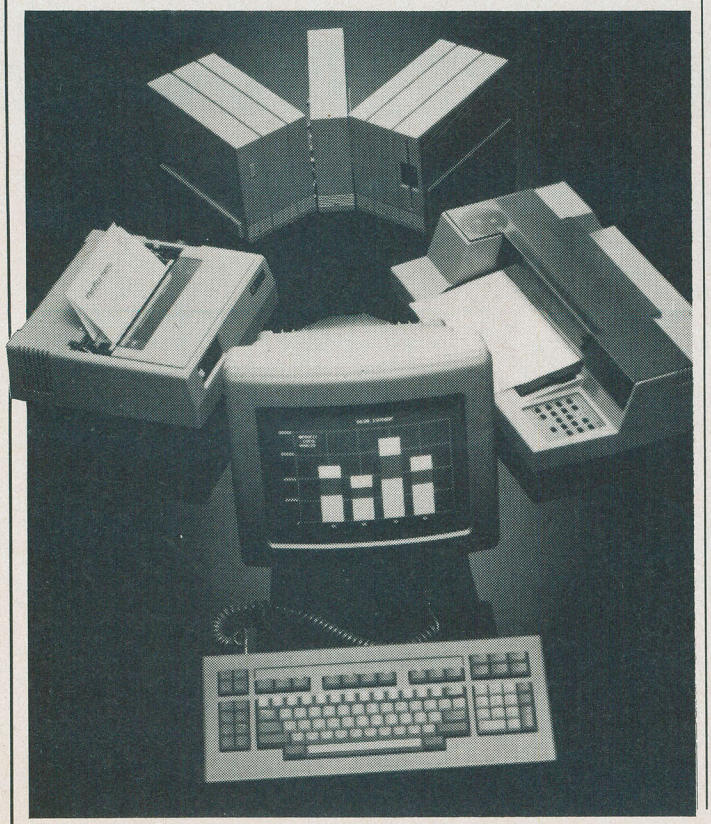
As options, IBM has also introduced 128K memory expansion attachments, a power expansion attachment and a speech synthesizer for the PCjr as well. Using the power expansion unit, up to three 128K attachments may be implemented to provide a maximum of 512K user RAM. The memory attachments are complemented with RAM-disk software.

Professional Computer

TORONTO, ONTARIO — *Datapoint Canada* has announced a new professional computer for the business environment. The **Vista PC** is based on the 80186 16-bit microprocessor, and includes 256K of RAM. A high-resolution colour monitor is standard, and complements the 720 by 348 pixel graphics the computer is capable of.

The Vista PC, manufactured by Convergent Technologies, Inc., can run MS-DOS, has widowing capabilities and can be used alone or in a networking environment.

Interested parties can contact Datapoint Canada at 4881 Yonge Street, Suite 700, Willowdale, Ontario M2N 5X3 or call (416) 222-8005.



VisiCalc Rebundling

NEW YORK, NEW YORK — *Software Arts* has made extensive enhancements to VisiCalc and VisiCalc Advanced Version and is now offering both programs together as the **VisiCalc Package**. Dealers with older versions of the two programs for the Apple //e and III computers will be able to exchange them without extra cost for the two-in-one spreadsheet package.

The VisiCalc Package is available to Apple //e and //c users, supports both DOS 3.3 and ProDOS, and contains *The VisiCalc Book* for added program reference.

Features added to VisiCalc include full word prompts and variable column widths. The VisiCalc disk also includes six home management and finance models. Enhancements to VisiCalc Advanced Version include an on-line introductory guide, context-sensitive help, one-key macros, varied single cell formatting, variable column widths and date functions. Both programs support either 40 or 80 column displays.

Apple //e users can run either program in the package. Apple //c users will require an external second drive to implement VisiCalc Advanced Version.

Tennis, Anyone?

OAKLAND, CALIFORNIA — **Martina Navratilova**, the undisputed number one ranked women's tennis player in the world, has signed a service contract with *ComputerLand Corporation*.

The agreement calls for Martina to wear a ComputerLand patch on her sleeve, film 30-second 'tennis tips' for company commercials and appear in point-of-purchase advertising. The contract guarantees her appearence in the ComputerLand U.S. Women's Indoor Tennis Championships.

continued on page 90

Next Month In Computing Now!

BDOS in BASIC

Powerful as it may be, there are a number of things that you simply can't do in Microsoft BASIC due to a lack of low level system control. There is a way around this, however . . . it involves using machine language imbedded in BASIC programs. Next month we'll look at a startlingly painless way of doing this and a complete implementation of system calls in BASIC.

Directory of Computer Stores

Yes, it's one of the most powerful three phase semi-automatic cattle management software packages available . . . but you still don't know where to actually acquire a copy of it. You need the Computing Now! directory of computer stores. This exhaustive list, updated constantly, will tell you where your local micro dealer is even if your local is Glace Bay.

Across the Pond

One of our number recently returned from an extended trip to Britain with news of the computer scene over there. It's really interesting . . . and very much different from the way things have evolved here. There's a mass of interest in low end systems and games software . . . and very little in business computing. We'll look at the complete tale next month.

Otrona Reviewed

The Otrona 2001 personal computer looks like it has been designed for use by really fierce executives . . . or Conan the barbarian. It can pretend to be an IBM compatible . . . or it can be something unique and all of its own. It's sort of portable in the same way that a house isn't and is unusually interesting to play with even if you can't find the power switch. The whole beach party happens in thirty days.

Also coming in October Software Now's First Edition

Hayes. Leading the way with quality telecomputing systems for the personal computers that businesses use most.

When it comes to communicating—computer to computer—Hayes says it best. All you need is a Hayes Smartmodem (it's like a telephone for your computer) and Smartcom II® software, to get you into all the right places.

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Introducing our new Smartcom II. More connection capabilities. More convenience.

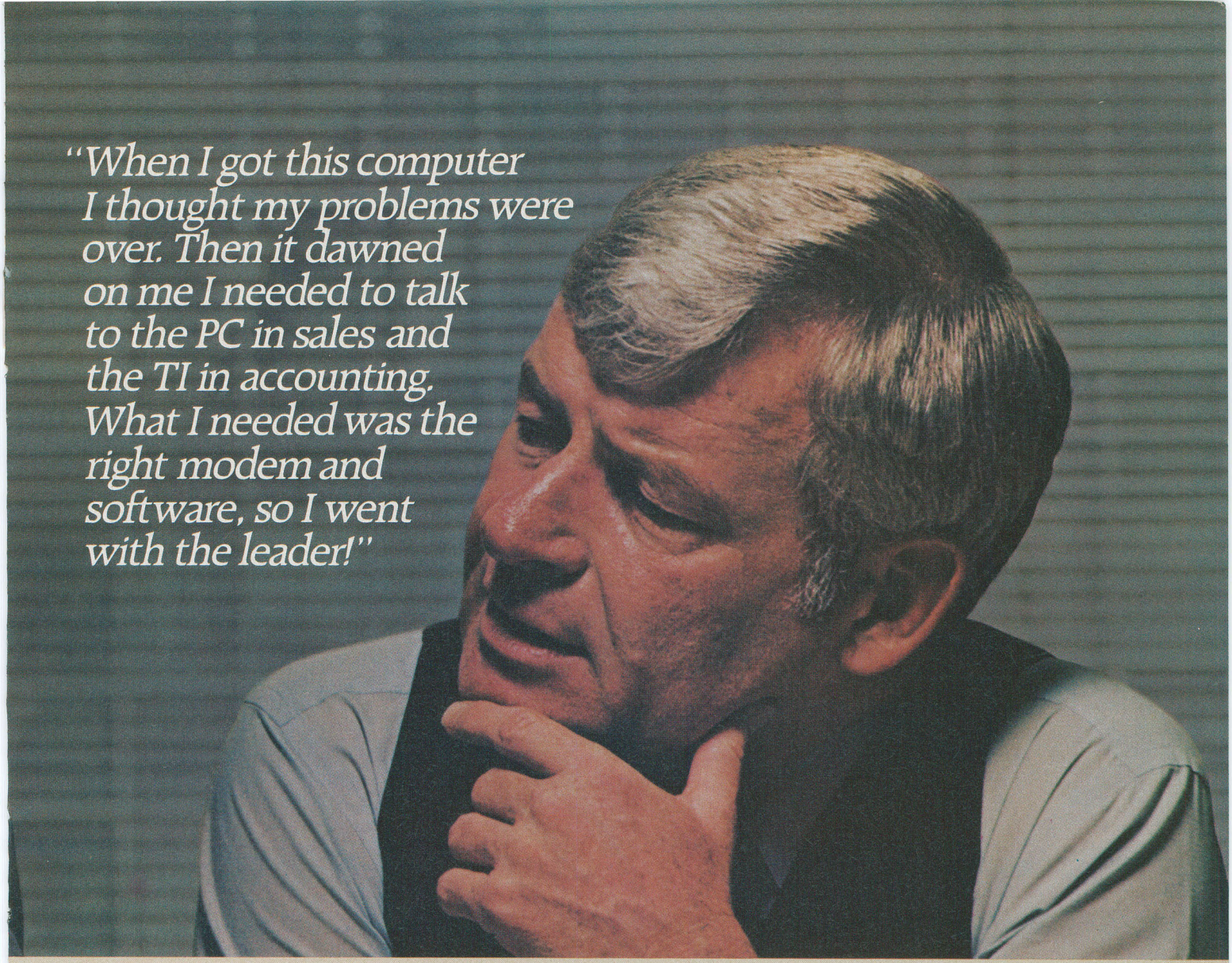
Now Hayes goes even further to streamline your communications and optimize your connections.

Smartcom II software is currently available for more than 16 personal computers (with even more to come). That means you can communicate, Smartcom to Smartcom, with an IBM PC, DEC Rainbow 100, HP 150, TI Professional Computer* and others.

And that's not all! Smartcom II also emulates the DEC VT100 and VT52 terminals, now in widespread use in many businesses. This feature lets your personal computer "pretend" it's a DEC terminal, opening the door to a vast installed base of DEC minicomputers!

We stand on protocol.

In addition to the popular Hayes Verification protocol, the new Smartcom II also includes the XMODEM protocol, ensuring accurate transmission to a wide range of personal computers and mainframes at information services. By matching the protocol (or "language") of a remote computer to yours, Smartcom II can transmit information error-free, regardless of interference on the phone lines.



Voice to data—in the same call!

With Smartcom II, you can easily switch from voice to data transmission (and back again), all in the same phone call. This saves you time and money, since you don't have to hang up and dial again.

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With an unsurpassed record of reliability, it's a small wonder Smartmodem is such a smart buy! Smartmodem 300™ (the first of the Smartmodem series) dials, answers and disconnects calls automatically. Smartmodem 1200™ and Smartmodem 1200B™ (it plugs into an expansion slot inside an IBM PC or compatible), provide high-speed, high-performance communications for businesses of all sizes.

And when Smartmodem is purchased with Smartcom II, you have the most dependable telecomputing system available for your personal computer.

Everything we do at Hayes is designed to make communications easier for you. Feature-rich, direct-connect modems. Menu-driven software. Concise documentation. *And* a customer service organization, second to none!

See your dealer right now for a hands-on demonstration of Smartmodem and our latest version of Smartcom II. From the telecomputing leader. Hayes.

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Circle No. 10 on Reader Service Card

Sight and Sound for the Apple

The owners of Apple compatible systems have access to the largest assortment of hardware accessories going, turning the computer into everything from a word processor to a Hammond B3 organ. Here's a look at two shiny brand new ones.

by Steve Rimmer

After laying awash in the doldrums of technological mediocrity for some time the Apple seems to be once again experiencing a rebirth of interest on the part of some fairly innovative designers. For almost half a year now the producers of Apple compatible peripherals have been patiently emanating newer and better printer interfaces, RAM disks and all manner of other really boring fiberglass. If another new disk drive controller so much as shows its face in my office I'll plug it in with the power on and play Grateful Dead music while it sizzles.

However, just recently there seems to have been a bit of life on the horizon. Several manufacturers appear to have simultaneously pushed the pen up buttons on their CAD plotters and emerged with some really lively hardware. This is good stuff, toys to displace lesser cards and give the Apple still more immense capabilities than it could ever have imagined. Of course, this doesn't take much... it's hard to program a lot of imagination into forty-eight K of memory.

This month we're going to look at two new highly brilliant accessories for the ubiquitous fruit. Far from being mundane, these things fairly hum with interesting activities... one of them quite literally so, in stereo. They will blast your fruit far beyond the range of being a mere video game or word processor.

Yank them tops off, me buckos...

Classic Music Machine

Not surprisingly, Classic Organs builds organs. You've probably never heard of them because for the most part the organs that roll out of their secluded Markham industrial park suite wind up in churches rather than under synthesizers for a good jam.

Classic Organ is a really hot name in liturgical music, though... which may not begin to explain why they've gotten into their most recent departure from the mainstream rock of ages sound.

The *Classic* is an organ type keyboard that plugs into an Apple and, along with a set of music cards, turns the otherwise nearly mute fruit into one of the most profound keyboard instruments available. About as far removed from control G bleep as one can be without a warp drive, the Classic music system features sixteen fully programmable voices, tune recording and editing, multi tracking and other stuff too amazing to even consider right at the beginning of an article.

For a number of reasons, it's the most flexible and the most playable music system available for an Apple][+.

Addagio

Popping a keyboard into your Apple and wailing is not a wholly new experience. There are, in fact, two popular music systems available, these being the Alpha Syntauri, from Syntauri Corporation, and the Soundchaser, from Passport. Both are pretty decent machines. However, insofar as the serious keyboard banger is concerned, both have limitations which make them less than ideal instruments.

The first of these is simply that they are mutually incompatible. Both packages have strengths and weaknesses which complement each other... but you gotta buy 'em both to get the whole talking elephant act under one tent. Neither is cheap.

Secondly, both of these systems are besieged with the curse of the barbarian sixteenth century hammer touch keyboard. They feel suspiciously like Pratt Reeds, although it would be hard to tell without ripping one apart, something they won't let you do down at the music store.

The keyboards don't seem bad if all you're used to playing on is either a typewriter or a ninety-nine dollar chord organ from Woolco. However, once you get fairly decent at it all they're a downer... their action is very much opposed to light, fast movement. This is a drag, as it keeps an otherwise flexible instrument from being nearly as as much of a ride as it could be.

The Classic system is built around finer stuff. To begin with, it is will run nicely with software supplied by either of the two existing computer synthesizer system manufacturers... we'll get to all that presently. It's also based on some really superb keyboards which the lads at Classic came up with in Italy.

The Italians largely invented keyboards and, as such, have had quite a while to get them right.

With the advent of really nice keys the Classic system is a mind blastingly flexible thing. We're only going to be able to look at some of the gyrations you can perform with it... this overview should serve however, to give you some idea of the possibilities of the whole works.

Alpha Waves

In overview... at least at the level we're going to discuss them at... both the Alpha Syntauri and Soundchaser software packages are essentially similar. Both have positive features when you get deep enough into them, but either will serve to illustrate the power of the Classic hardware.

As I noted above, you can have both of them if you want to. We're going to look at the Alpha Syntauri package... largely because it was the first one I opened when I tried this thing.

To be fair, the Alpha also comes with better tunes. Some of the canned music that accompanies the demonstration software is superb for being cruel to. Ever head Pachabel's Kanon played by a forty piece saxophone orchestra like jazz? The graves of Baroque composers all across Europe are emanating a strange unearthly shrieking sound even as you read this.

The largest problem with the Alpha package is knowing where to start describing it. It's somewhat massive. Probably the most sophisticated of its many appendages is something called *Metatrak*... a kind of piano player in a five and a quarter inch black square.

Like all of the Alpha software, Metatrak is configured for whatever way you happened to stick the cards into your system. The software will be looking for the existence of a minimum of five cards in the Apple, to wit, a language card in slot zero, a disk drive controller in slot six... it doesn't have to be there but it always is... the Classic keyboard controller card in any slot you like and the two Mountain sound cards... we'll get to them presently... in any two consecutive slots of those remaining.

The Soundchaser software isn't nearly that flexible... it wants the keyboard in slot seven and the sound cards in four and five. Inasmuch as the Classic system can handle both systems this would be the logical place to put the cards.

When you first boot up Metatrak it makes a number of choices on your behalf. The first one involves its loading a set of ten *presets*. A preset is a sound, essentially one digitized cycle of the waveform that will eventually make it out of your speakers when all this is over with. The ten presets are a variety of voices which your can play through the organ keyboard. Included are some fairly decent ones, such as bells and organ sounds, plus a number of pretty spacy ones, like outer space noises and car horns.

Bach does not play well in car horns.

The presets live in files. You can create your own through a number of means provided by utilities incorporated into the system. Files can be altered after their creation, so you can put together files of your favourite instruments. The files load quite quickly, and, thereafter you have ten instruments on tap at any one time. A preset is activated by hitting the appropriate number from zero to nine of the Apple's keyboard. That's the QWERTY keyboard, that nasty one with the letters on the keys.

If you're new to all this musical stuff you may wish for letters on the keys of the other one too. Sadly, they don't come that way.

Having selected a preset or, failing this, allowing the system to default to "bells and feedback", its pet noise, you can play something on the organ keyboard. Sound will emerge from your speakers if your amp works and all will be well. It's hard to describe the realism of the sounds you can get out of one of these things except to say that if you like genuine pipe organs, brass, pianos and suchlike you'll get into this thing every bit as much.

The only difference between a recording of a pipe organ played through one's sound system and the Classic system played through the same sound system is that the record probably cost about ten bucks and the Classic system rather more. On the other hand, you can't suddenly decide you want the organ on the record to become a heavy metal band.

When you play music on the Classic keyboard running Metatrak the screen produces this... display. It's highly weird and well recommended for anyone who likes coloured lights. You get these little glowing boxes on the tube that dance around in relation to the keys that are down at the moment. It looks like the last part of Close Encounters.

This Month in Electronics Today

Radio: What's Happening

Our special feature this month updates you on what's been happening in broadcast, shortwave, and telecommunications radio. AM Stereo, for instance, looks at the trend to improving the sonic quality of AM broadcasting; on a listening test, we couldn't distinguish AM from FM.

Interested in long-distance reception? Our DX article takes a tour of distant stations with nothing more than a standard AM radio.

Cellular telephones are the coming gadget; multiple broadcast sites controlled by computer means the possibility of low-cost, reliable phones in any car.

Commercial shortwave is rarely mentioned; we look at some of the stations broadcasting in Canada, as well as some of the amazing receivers available.

Metronome Project

Having trouble with tricky rhythms? Accent the beat with our Offbeat Metronome and the mysteries of notation are a little less intimidating.

Direct Broadcast Satellites

Roger Allan reports on the pros and cons of having a satellite network broadcasting directly to homes without the need for huge dish antennas.

Audio Test Set Project

Reduce workbench clutter (and cost) with our signal generator and amplifier all in one.

The RS232 Explained

Your computer probably has an RS232 port for talking to other computers. Here's how it works.

Apple ProDOS

After the advent of the Macintosh and 2c, it was only natural for Apple to upgrade the DOS 3.3 operating system. Here's a look at how it works.

ON NEWSSTANDS ACROSS CANADA NOW.

Classic Music Machine

More Noises

In addition to preset waveforms you can also have preset envelopes... sound dynamics specifications... to mix and match. In addition you can add slow periodic phenomena like tremolo. In short, the system can do all the things a sophisticated analog synthesizer can manage but with about a zillion times more control and flexibility in about a hundredth of the time.

Once you get over all the possibilities of Metatrak in what turns out to be its dumbest mode, you can get into some of its other tricks. The simplest of these is the capacity for splitting the keyboard.

Table 1

The Classic system needs a set of Mountain Music cards or something that will do the same thing. Classic makes Mountain compatible cards which use different technology to make the same noises with... as opposed to some of the clone cards around. Also unlike most of the clone cards, these work. They cost $295.00 per set.

A keyboard... without the case... is $325 or $350 for one with velocity sensing contacts. You can get the basic keyboard in kit form for $195. An oak case is $140.

The interface card for the keyboard... the thing that plugs into the Apple... is $95. This supports both Soundchaser and Alpha Syntauri software.

The whole shooting match all put together and ready to rip is $795.

Classic Organ can be found at 300 Don Park Road, Unit 12, Markham Ontario L3R 3A1 1-416-475-1263.

Passport Designs Incorporated, which does the Soundchaser, can be reached at 116 North Cabrillo Highway, Half Moon Bay, California 94019 1-415-726-0280.

Syntauri Corporation lives at 4962 El Camino Real, Suite 112, Los Altos, California 94022.

In order to be able to play really complex sounding stuff all by yourself it's often desirable to do the left hand stuff and the right hand stuff in different instrument voices. The Metatrak package allows one to split the keyboard up to eight ways... although, for most things, anything more than three splits gets a bit unwieldy. Each split can then be assigned its own preset.

Split setups can be saved in files and loaded quickly upon later playings.

The most outrageous party of Metatrak, however, is the ability of the system to pretend it's a sixteen track tape recorder... hence the name, I suppose. The system has a number of screens and displays to present various parameters of a multi track recording in proper computer lights and letters and, when you get your head around it all... it takes a few days... you can manipulate it exactly like a sixteen track reel to reel, including being able to dub and punch in each track whenever the inspiration zaps you and, finally, to be able to mix the whole mess down to stereo for preservation on a cassette or playing through a regular sound system.

Of course, using the Metatrack to handle multi track recordings is, not surprisingly, rather more flexible than using physical tape. You have note by note control over things and all the flexibility of the system in general. The only fundamental limitation is that the music hardware limits one to having sixteen *voices*, in addition to the sixteen track restriction... that is, sixteen sounds happening at any one time.

Coda

The Classic system really blows away the last limitations of Apple sound. It's well crafted... in Canada, of course... and transcends the hardware limitations of the other systems which, one suspects, deliberately incompatible with each other.

In order to get one of these things together one needs a fair bit of aggregate stuff in the same general space. To begin with, you'll want a forty-eight K Apple compatible system and a stereo amplifier.

The Alpha package requires a sixteen K memory card. The Soundchaser insists on being able to use slots four, five and seven... if you have an enhanced clone make sure that you can manage at least one of these requirements.

The occasionally referred to sound cards are, in fact, Mountain Music boards, a pair of fiberglass jokers that join at the top through a connector and live in consecutive slots. You gotta have these things in some form for the system to make any noise.

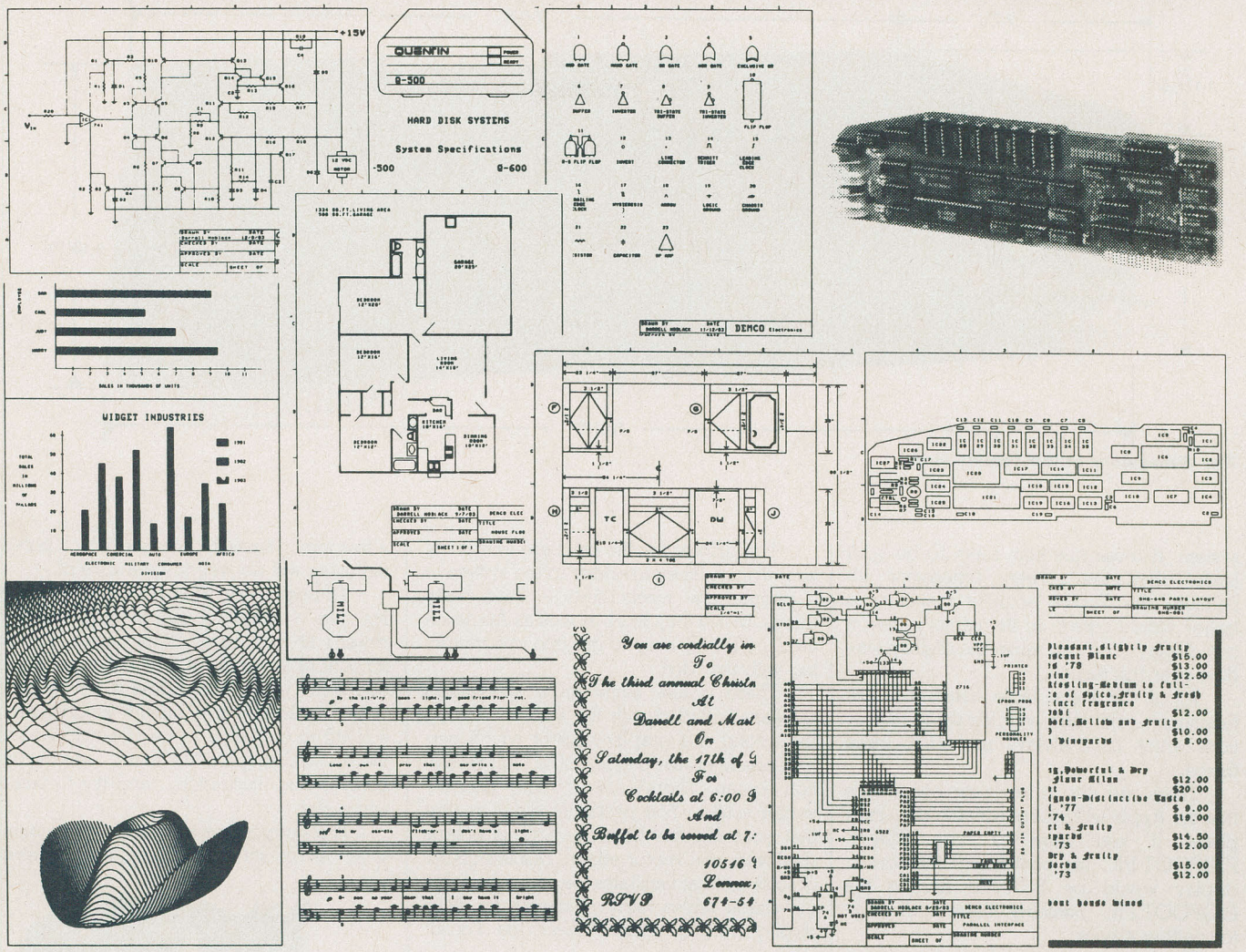
Finally, there is the keyboard and interface.

The other component of this party is the software. While Classic is working on software of its own, they do not sell any software with the system at the moment. However, both the Alpha Syntauri package and the Soundchaser software are available from their respective manufacturers directly. You can choose which one you'd rather go with.

The Classic sound system is right up there with the Micron Eye and the Koala pad on my list of splendid things to connect to a fruit. It's well built, reasonably inexpensive and flexible.

Get one and wail.

Graphics Tool Kit Review



The Apple's inherent forty column screen has always been among its most tedious stumbling blocks. Plugging a Videx card, or other eighty column device, into the system renders its display in a more professional format... but only at the expense of forgoing all manner of high resolution graphics while one is looking at the longer lines.

The Graphics Toolkit is a card and some software which implements an extremely high resolution display for the Apple. It gives rise to the Canadian Tire theorem of computer development... if the old clunker hangs around long enough all its parts will be replaced. Without any imagination at all... given a decent enough monitor to show the thing though... you can boot this monster up and pretend you're looking at a Macintosh.

This illusion is further enhanced by the availability of a version of this package which supports a mouse.

The display provided by the Toolkit card is about as sharp and solid as one can envisage a video screen being, rendering six hundred and forty dots horizontally by three hundred and eighty-four vertically. By comparison, the screen of a Macintosh can present a mere five hundred and twelve by three hundred and forty-two pixels.

Based on a 68A45 cathode ray tube controller... the same type of chip used in the Videx card... the Toolkit's works have been seriously thought about and contain a number of really decent features. For example, the card has a built-in soft switch. You plug the output of your fruit into the card and the output of the card into your tube. When the card is supposed to be doing something it makes the monitor take its signal from the high resolution display generator. At other times you can look at the normal forty column display.

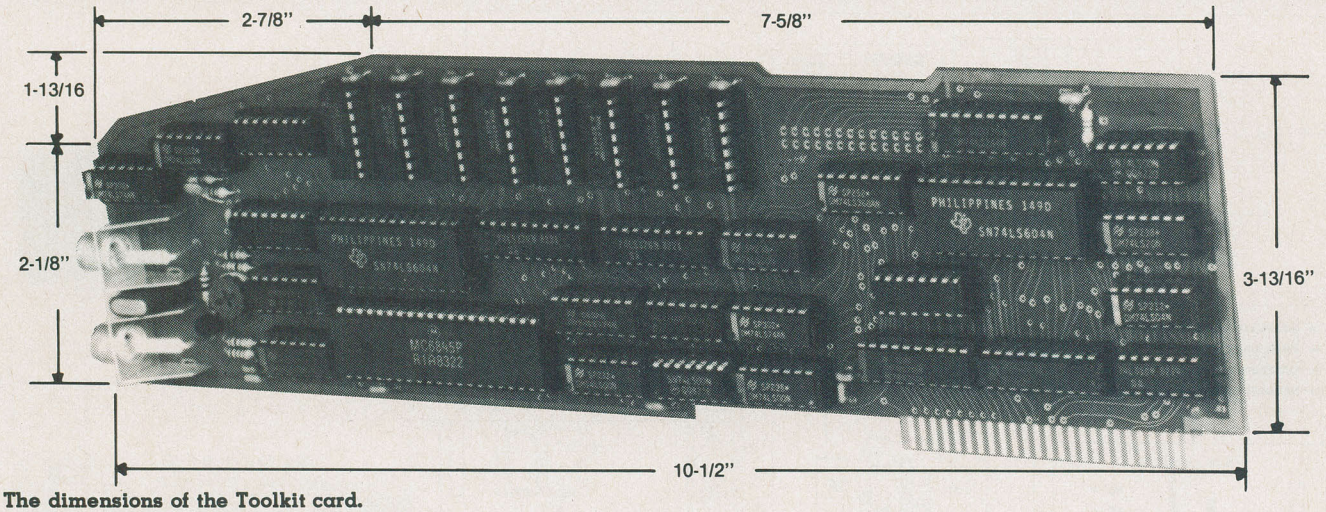
The software included with the package... we'll get to what it can do in a bit... supports not only the graphics but also a selection of printers and interfaces. The whole dog and pony show is listed in table one. Having a printer is essential to properly appreciate the profound party this thing can be... it can dump high resolution images to hard copy, you see.

Sharp and Nasty

The simplest way to use the Toolkit card is to run it from Applesoft. Upon booting the supplied software the system will install about two K worth of hardware drivers which make several changes to Applesoft's high resolution routines. Having gotten this together you can use all of the usual high resolution commands normally supplied under the language plus a few new ones.

To begin with, things like HPLOT work in the same way as they always did... except that they have larger ranges. The command HPLOT 0,0 TO 639,767 produces the longest straight line you can draw on the

Graphics Tool Kit Review



The dimensions of the Toolkit card.

system. If those numbers seem to be a bit larger than the screen dimensions it's because the Toolkit actually maintains a larger virtual screen in its memory than it can display. You can move the display window over this terrain.

All of the shape table commands are functional... although with the same restrictions which have always applied to these things.

There are also a few new commands that the Apple will accept with the drivers in place. If you were to type SSAVE PIGFOOT.PIC the contents of the screen display would be BSAVEd as the file PIGFOOT.PIC. Similarly, there is SLOAD for getting it back.

The system also installs a number of ampersand commands. For those unfamiliar with this facility of the Apple entering an ampersand character after the square bracket BASIC prompt on a fruit will invoke a user written routine if one has been installed. The ampersands in this case allow one to dump the screen contents directly to a printer and to scroll the display window up and down the virtual screen memory.

The Toolkit card produces a wholly monochrome display... you can have any colour you like provided it's green... or amber, or white, or whatever it is your tube normally likes to provide. As such, while the HCOLOR command is still accepted, it's interpreted slightly differently. Values from zero to four produce black images while everything else does white.

The HGR command works just the way it always did, except that it invokes the Toolkit's display, toggling the soft switch, rather than the Apple's high resolution image.

The drivers for the card are extremely well written. They interface to the system to a degree one rarely finds in third party things. In use they work as well as Applesoft itself... it's very easy to get into programming with the card.

There is also some more specialized software included with the system. Among the throng is a graphics editor which permits one to create pages on the high resolution screen. There's also a really decent vector editor. You probably didn't realize that your life has been a vacuous hollow shell without a vector editor. This is a chunk of software that facilitates the creation of Apple shape tables fairly painlessly for later display and movement about the Toolkit tube.

There is also software for displaying text on the screen, with the additional capability of defining what the characters therein will look like. You can also define the size of the letters... text up to seventy-two pixels high and eighty pixels wide can be accommodated. Naturally, large letters take up quite a bit of RAM just to store the patterns themselves. The system helps you keep track of how much room is available.

Naturally, font patterns can be saved to and loaded from the disk.

There is also a number of incidental images on the disk specific to particular tasks. You can SLOAD them into the Toolkit graphics window if you want to meddle with them. Included are such things as a ruled up blank drafting page and a score sheet for writing music.

The Inevitable Gotchas

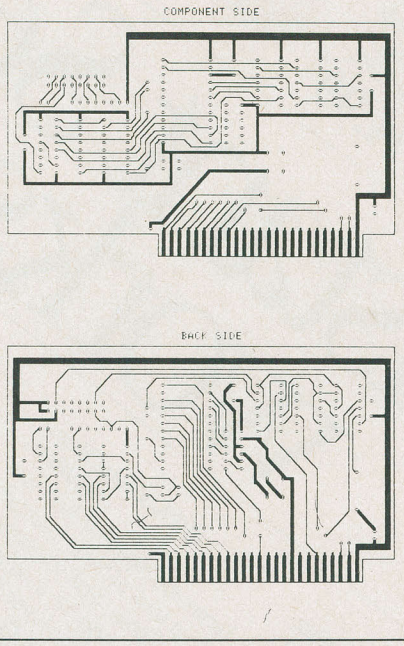
The Graphics Toolkit is a splendid piece of work with no serious design flaws. There are a few minor hassles, however, which potential users will do well to be aware of.

To begin with, the card is big. It barely fits into a standard Apple type case. It doesn't fit into many clone cases, and no amount of swearing at it will change this. If you don't use a real Apple it would be a very worthwhile five minute kindergarten activity to cut out a piece of cardboard to the size and shape of the thing... see the accompanying illustration... and try to jam it into a slot.

The slot you use isn't terribly critical insofar as the software drivers are concern-

Specs...

Card:	**The Graphics Toolkit**
Manufactured by:	**Demco Electronics, 10516 Grevillea Avenue, Inglewood, California 1-213-677-0801**
Function:	**Ultra high resolution graphics**
System:	**Apple II, II+, IIe**
Resolution:	**640 x 384 pixels, monochrome**
Power dissipation:	***1.885 watts***
Price:	**$495.00 U.S.**



A typical Toolkit image, as dumped to a printer.

ed... they'll locate it when they're installed. However, the card must be in a higher slot than that of the Z-80 card if you use one, as this looks like a Toolkit to the drivers as it scans downward for its friend.

One of the largest gotchas is the power the thing draws. Ahem... it sizzles along dissipating just under two watts. This is really stretching it for a real Apple and not all that comfortable for even some of the enhanced clone power supplies. As such, in order to use the card one should plan on decimating the rest of the slots in one's fruit insofar as it's cool to do so. You'll want to keep the disk drive, of course.

A fan is essential, and leaving the top off the computer while the card is running is a good trip too. Tying the Apple to a large cube of dry ice or immersing it in a vat of liquefied helium is necessary only if you want to go on a programming binge lasting for several days.

Needless to say, the card pretty well has to be removed from the computer when you aren't using it. Aside from the heat it produces it also confuses some software which does similar scanning for other types of cards. This is a minor pain, as the thing is a bit of a squeeze to get in there in the first place.

In fairness, it should also be mentioned that of the many Apple compatible systems around our offices there was one which simply refused to run the card... although it runs everything else quite willingly. We don't know why.

Finally, the Toolkit display looks like a well cut diamond on a good monitor and not unlike a bowl of cream of newsprint soup on a bad one. If you have a really ancient nasty old box atop your fruit you may experience some hassles with it.

The Graphics Toolkit is a really decent thing, and well worth considering if you want to see splendid looking images on your monitor. The software is well written and documentation is easy to get through.

It's a slice, y'know...

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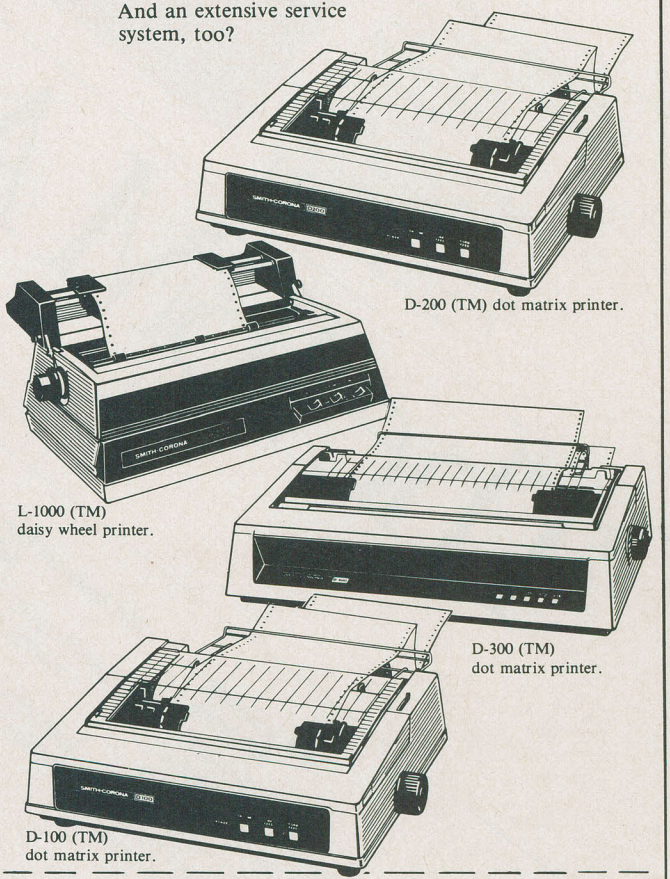
Question: What printer company offers print quality that challenges printers costing hundreds of dollars more?

Question: What printer company offers dual interfaces for all four of its printer models?

Question: What printer company offers removable and adjustable tractor feeds as standard equipment on all of its dot matrix models?

Question: What printer company has telephone numbers to call if you ever have a problem? And an extensive service system, too?



D-200 (TM) dot matrix printer.

L-1000 (TM) daisy wheel printer.

D-300 (TM) dot matrix printer.

D-100 (TM) dot matrix printer.

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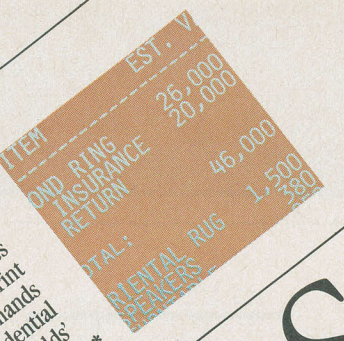

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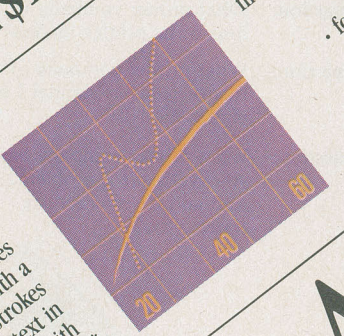

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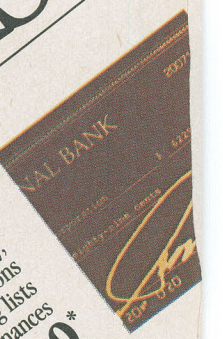

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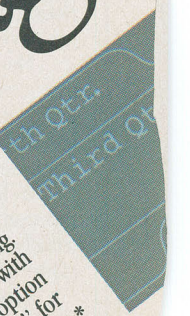

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Circle No. 23 on Reader Service Card

Unpacking the CBM 8296

The Commodore 8296 is a splendid computer with a ragingly powerful integrated software package, an inoffensive name and a case that appears to have been designed by a leprechaun on acid. All in all, it's a first rate box from the folks that brought us computer adoration on the tube.

by Steve Rimmer

There are a number of good reasons why the new CBM 8296 will never become a really popular mass market chrome plated slick consumer computer. To begin with, consider the number. Commodore has always liked to give their systems numbers, most notably the locust–like plague of sixty fours. Consider 8296 as a really hip bag of digits... it just doesn't dance.

All together now... "I like to fix my 8296." It's a turkey of jingle... the meter's all wrong. Other possibilities, such as "I throw sticks at my 8296", "there are oil slicks on my 8296" or "shaved cats don't mix with an 8296" are marginally more aesthetic but suffer to an even greater degree from rampant meaninglessness.

If you do wind up buying one of these systems, then, keep in mind that you will never be able to get much interest in it when the conversation turns to computers on Sunday afternoons at the bullfights. Wearing a CBM 8296 button will make people think you are an employee of wherever it is you are standing at the time and attempt to address you by your number.

All of your glory will be silent.

The 8296 is, however, a very powerful machine despite its obtuse numerology. Lacking high resolution graphics, sprites, sound synthesis, joysticks, paddles, light pens and little cartoon swamp gnomes in its manuals it isn't a likely up market replacement for the home games machines. However, if you want to boogie down with the suits this is a meaningful contender. It's the latest CBM system for the office.

A PET Rock

The major screaming point of the 8296 is its intense integrated software package. Like so many other systems at the moment, the machine is not just a hollow shell full of BASIC, but, rather, comes up ready to handle a variety of useful business tasks. It has a built in menu which beeps and thinks for a second after one hammers the power switch and then offers the wary human such technological delights as word processing, a spreadsheet, file management, a telecommunications terminal, BASIC if you really must and easy access to its utilities.

This, even before one gets heavily into things, is a splendid enhancement over earlier Commodore computers. Because of the structure of the CBM "operating system"... actually an extension of the on board BASIC... running applications programs has always called for some unpleasantly computer like syntax. Having the menu spew this out in one's stead is considerably less involved.

In the tradition of integrated software, one can use the 8296 while remaining painlessly ignorant of all the workings of the computer itself. If you can recognize a disk drive and count from zero to one you can boot the system and call the functions from their respective sleeps. Having done this, of course, further cerebral resources may be called upon... you're on your own.

We'll have a closer look at the software integrated into the package in a moment.

The 8296 is not very different from most other Commodore machines in operation. Even VIC-20 owners will find themselves in fairly well trodden territory. It has a built in green screen monitor, a separate box with about a megabyte of mass storage on a pair of five and a quarter inch floppies and a detachable keyboard which, while similar in appearance to that of the low cost CBM home systems is rather nicer in operation. The case... well, yes, the case does look like a refugee from a late 'fifties B movie.

You should keep in mind that you don't compute on a case, though. The insides are pretty good. This is what is called "ergonometrics", and one day science will find a cure for it.

The computer itself is based on the well exercised 6502 microprocessor, the very same little beast that powers the Apple II+ and many furnace controls. It has a hundred and twenty-eight K of RAM in there, bank switched into two sixty-four K blocks, the upper, or *expansion* block of which is further subdivided into sixteen K blocks by the machine.

The computer is based on the 6502 microprocessor ...

This is all completely meaningless, of course, except that it works well with huge spreadsheets and other memory intensive things. The CBM's peripherals... notably, in this case, the disk drives... are not excessively fast. As such, the software tends to do its scratching and internal memos in RAM. Having all this memory available makes for some pretty slick applications.

Some of the software which uses all this silicon makes the 8296 a pretty nice box to sit in front of. For instance, unlike as in earlier CBM machines, there is the equivalent of four full screens worth of RAM set aside for the video display. This seems a bit pointless but, in fact, it allows data to be written to all four pages and then brought up instantaneously whenever it's needed.

The spreadsheet package integrated into the system, for example, makes use of this capability to hold its help pages. This is much slicker looking than the spreadsheets for other operating systems that have to fetch their help menus from disk files.

The 8296 supports the usual assortment of CBM interfaces for the outside world. In-

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Unpacking the CBM 8296

cluded in these are connectors for two datasette cassette recorders, a simple eight bit *user* port for unadorned I/O and an IEEE 488 bus which handles most of the machine's system input and output... for example, communicating with the disk drives, the printer and a modem if you have one.

This unusual peripheral arrangement has its advantages, most notably that one need never find one's self lost for a port. Rather than being a simple interface, the bus structure allows a large number of external devices to be hung onto the same physical connector... in this implementation funny looking plugs allow you to snap 'em together like digital lego... and then selected in software.

In order to access the disk drives, for example, you tell the bus you want data from a specific file and tell it that you want the data to come from device eight. While not infinitely expandable this is considerably more flexible than systems which come with a finite number of ports and no way to easily expand upon them.

Soft Parade

The small petting zoo of software that comes huddled about the 8296 is called the *Execu-desk,* further proof that the lads at CBM have, indeeed, been tuning into the late, late, late show when they air the Martian movies. However, despite this auspicious title the bits within the virtual drawers of this nonexistent desk are first rate stuff.

There isn't a generic package in the lot. Space, as they say, is the final frontier, and not having entirely conquered it its smallness we won't be able to go into really subterranean depth regarding all of the software. However, check out these snaps.

The first item on the power up menu of the system is word processing. If you choose this as your main course you get a roll and butter and thereafter a boot into that always popular character jammer, PaperClip. While there are other word processing packages for CBM machines this is easily one of the best.

PaperClip is a very capable system. It was written with the specific keyboard layout of CBM systems in mind so, for example, it is happy using the cursor keys to move the cursor... rather than meaningless control characters. Likewise, the screen editing works very much like that of Commodore's Microsoft BASIC. This will be meaningless to you if you don't program in BASIC... suffice it to say that the Commodore BASIC editor is extremely good.

Using the package is quite a bit different from entering text into many of the more common full screen editors, such as trusty WordStar. To begin with, the system does not do any on line text formatting when you type stuff in. Rattling away on the keyboard produces a screen full of broken lines and things that simply reach the end of the tube and wrap.

This is it... the case! Note the detachable keyboard.

Hitting the carriage return key puts an arrow symbol on the screen to indicate that a paragraph has ended or that you don't type terribly well.

The text can be edited by placing the cursor on a line and hitting the insert key to open up some space or delete to snuff offending characters. There are control sequences, initiated by the reverse on key... it's located in a convenient spot... to do more complex things like saving and loading text, search and replace, inserting lines and so on.

When you finally get the jumble of text on the screen reading the way you want it to you can make it look real with a formatting command. This doesn't do much for the mess you've created... like a great original, it's left untouched. Instead, it produces a formatted version on another page of the computer's video RAM and pops it into existence.

You can format text onto the screen or out to a printer. We didn't have a printer that the machine could talk to and formatting it out into the atmosphere seemed pointless.

Word processors are among the most user sensitive applications going. If you play with enough of the gibbering trolls you will eventually find one that will behave for you. PaperClip is a good one to try... it's much faster than the WordStar package I live by and worlds simpler to master.

Three Sheets to the Wind

The spreadsheet for the 8296 is called CalcResult from Handic Software of Sweden. Don't worry... the documentation's

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Unpacking the CBM 8296

in English. It looks very much like a spreadsheet, works like one and won't fool anyone if you tell them it's Zaxxon in block graphics.

CalcResult is extremely quick as spreadsheets go... again much faster than most of the popular Z80 based packages. It seems to make quite a lot of use of the flexible video pages of the system, so screen updates are essentially instantaneous. The cursor is moved with the cursor mover keys and most of the standard VisiCalc style spreadsheet syntax is supported.

There's a really excellent manual which comes with the thing for users who are still used to conversing in something other than VisiCalc style spreadsheet syntax.

"Pardon me, James... SUM(B4:K12)?"

"Rather..."

There are features found on other spreadsheets which are definitely lacking in CalcResult. However, few if any will be missed in the general application of the system. As often seems to be the case with software designed for Commodore systems the authors of this thing have forgone a few esoteric features in favour of additional memory, speed and ease of use for the stuff one normally bangs away on most of the time.

The system has such noble bits as GOTO, REPLICATE, row and column erase, matrix movement and several permutations of recalculation. It can update its information on every entry, do global recalculation and even allows for recalculation which starts in places other than the normal upper left hand corner of the screen.

For the real spreadsheet aficionado there is a complete windowing facility. If you get sick of looking at one dull, lifeless sheet you can split the screen and see two of them. You can also punch a hole in your primary sheet to peek through a window at another one.

The windowing facilities take a while to fully get your head around... they're very flexible.

The package can display its data as bar graphs if you're into visual things. While it isn't Lotus it is a very nicely crafted application.

Further Adventures

The Consultant is a horrifyingly large data base manager... well, the books are pretty frightening, anyway. You get these two fierce behemoths with moss encrusted cast iron spiral bindings that look like they've been placed there by the demons of the underworld, for centuries daring mere humans to peel back their dreaded pages.

All right, then, they aren't exactly cast iron.

You can't really evaluate a data base management package in a couple of weeks... the Consultant worked very well for us, which means nothing because we weren't really able to set up work files that even began to approach the size of those which one generally spews forth upon the sacred mylar after a few months of storage.

The system seems to be pretty tight. It didn't explode or refuse to part with information we knew we had put in there... some of them do, you know, probably just to fox a human now and then. It was really quite fast and reasonably flexible in things like the sizes and numbers of fields it would accept and so on. It wasn't dBASE II but, then, we can't all be slow, funky and inefficient.

Specs...

System:	**Commodore 8296**
Processor:	**6502**
Memory:	**128K**
Operating system:	**CBM Basic**
Software:	**Word processing, spreadsheet, data base, manager, telecommunications terminal, financial planners, BASIC**
Graphics:	**No**
Screen display:	**80 x 24**
Disks:	**1.05 megabytes on 2-5¼ inch floppies**
Distributor:	**Local Commodore dealers**
Price:	**$1695.00 (computer only)**

There are three smaller functions on the system's menu. These include a telecommunications terminal, a collection of small business routines tied together as "financial planning" and a similar bundle of system utilities for formatting disks and the like. Being menu driven they're all terribly approachable.

The terminal is pretty straight up... it allows you to configure its assorted parameters through submenus. It has a text capturing buffer... which it can dump to a disk file for a poor man's download. It also has programmable macros, so you can have strings ooze out through your modem at the touch of a key.

The financial routines are actually fairly good. They can calculate amortization, annuity, future value, depreciation and other such useful things. The amortization tables are depressingly accurate... we just bought a new cave and I'm not really sure I wanted to know how long it's going to take to pay the thing off.

Drastic Plastic

There are a number of good reasons to hock the dog and buy one of these things. Dogs are a nuisance when you don't feel like feeding them for a few weeks. They like to bury bones in your house guests and they frequently chew mail that contains cheques.

The computer's pretty good too. It's solidly made, well supported and can avail itself of a pretty decent library of software. It appears to be capable of handling any of the software written for Commodore's 8000 series of systems.

The 8296 is, on the whole, rather nicer to use than many CP/M based computers and certainly more so than MS-DOS based ones for what it can do. The integrated software package provided with the system is powerful, convenient as a force field in a crowded subway and assembled from among the best individual packages available for the system rather than all blasted together by a single programmer.

You should buy a computer on the basis of the software it will run, or, to look at it differently, you should see if you can get into the packages and then check out the box that's around them. The 8296 is a nice box... so long as you can get along with the applications bundle that comes with it.

As is the case with all CBM systems, you are essentially stuck with Commodore's operating system and facilities. Claims by third party suppliers notwithstanding you really can't run CP/M, MS-DOS or any other extraterrestrial manifestations on it no matter how many doodahs you plug into the back. At least, you can't do it so as to have anyone want to actually operate the machine.

This is not a bad thing... there's nothing particularly slimy about the CBM software. However, before you consider enriching your karma with one these computers make sure you know what applications are available for it and how closely they match your needs and fingerprints.

The last aspect of the 8296 to consider is, of course, that case. It's best related to by immersing the system in boiling fiberglass for a couple of hours or looking at it through welding goggles. Perhaps some day glo flowers stuck on the side... a couple of pairs of stockings and a can of latex paint... a string art kit wouldn't hurt it any. There's always incorporation into a goldfish sculpture... **CN!**

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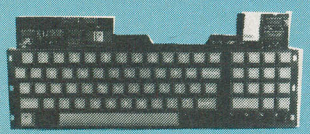

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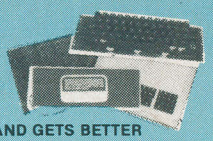

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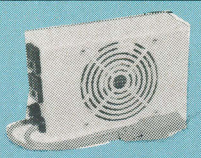

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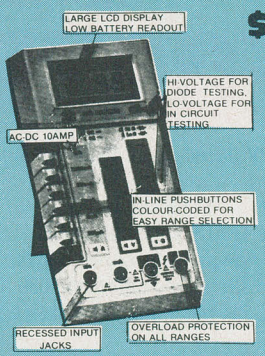

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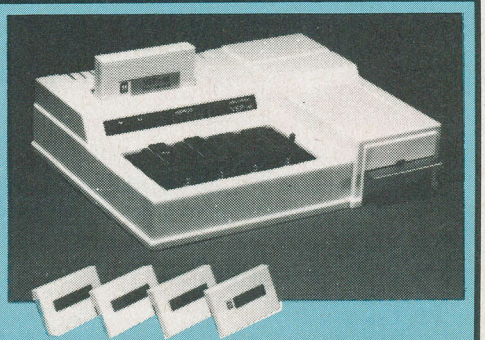

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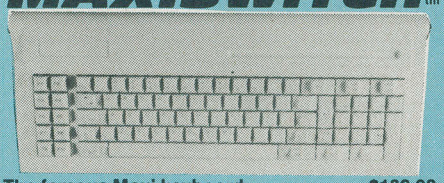

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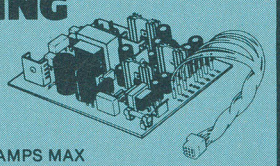

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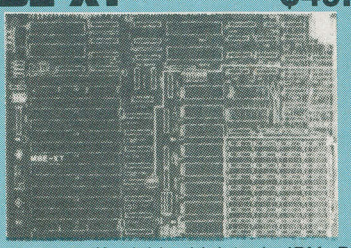

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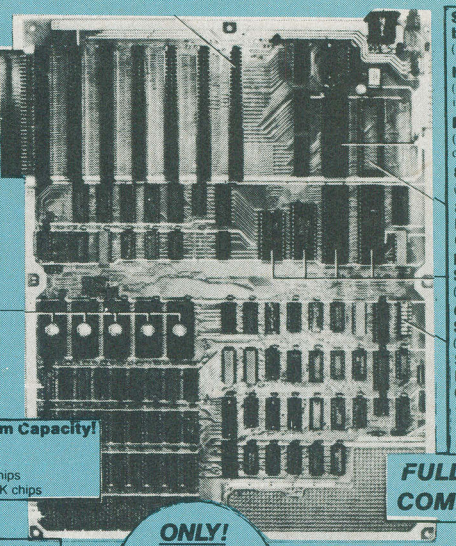

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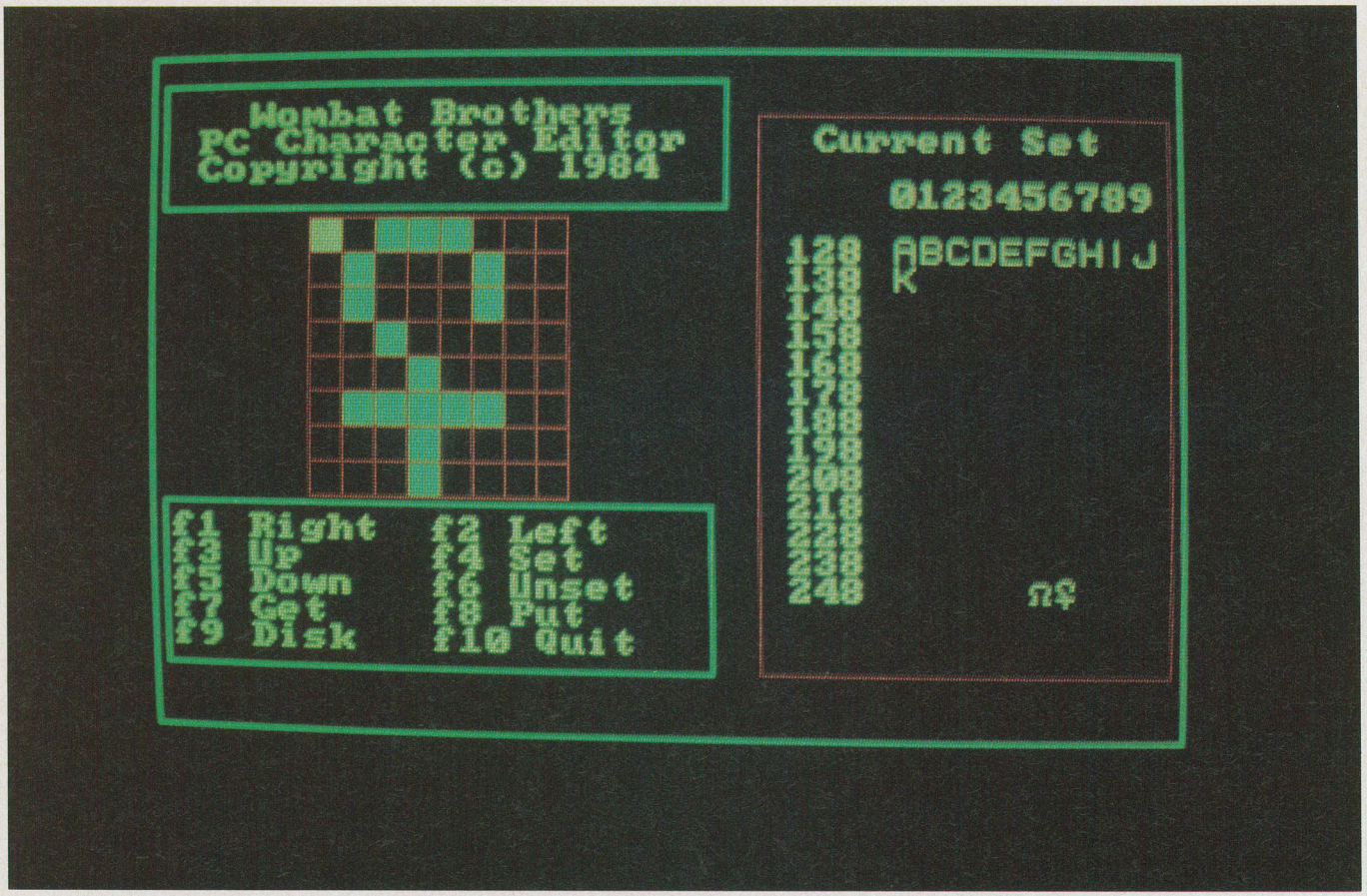
Character for the IBM PC



The character set of the IBM PC is all right for mere words, but when you want to PRINT pictures it's sadly lacking. It's time to send a couple of trolls in there with their tiny chisels and hammers and three speed reversible sabre saws to change a few things.

by Steve Rimmer

The graphics possibilities of the IBM PC are exceeded by virtually no other personal system... except for a few of the enhanced compatibles. Safely ensconced in the tender claws of Microsoft BASIC there are more ways to draw pictures on the tube than a disassembled carburetor has missing parts.

Most of the high resolution things, like LINE, DRAW, PUT and GET and so forth suffer from some speed problems. Animation in BASIC using the more sophisticated drawing techniques is both an exercise in long waits and tricky due to the high amounts of memory overhead some of these things take.

The best way to get fairly convincing animation is often to use one of the oldest approaches going, to wit, simply moving the characters around on the screen. However, while this works nicely on, say, a Commodore 64, which has a rich selection of graphics primitives in its character set, it is less than practical on an unadorned PC. The area of the character set which contains shapes and lines and such under DOS is blank under most implementations of BASIC.

In fact, it's possible to define the upper hundred and twenty-eight characters to suit your needs. They can be shapes to put together and form aliens with, special symbols for scientific or foreign language programs or an alternate typeface for use when you get sick of the one IBM supplies.

Getting access to the upper range of patterns is fairly easy. Making use of them, while not particularly involved in theory takes an awful lot of pencil grinding to actually get something happening with in this spatial dimension. One really needs a character editor... which is not a serious problem, as we've printed one in the next few pages.

Byte The Dog

The IBM's arrangement for defining its character set is a bit strange. The lower half of the range... the ones which normally crop up on the tube as a result of dropping things on the keyboard... is fixed in a ROM. The upper half, however, can be anywhere it feels like being.

There's a sixteen bit word at location 7CH that serves as a pointer to the block of RAM which we want the PC to regard as holding the character patters for the upper hundred and twenty-eight characters. This can be wherever you fancy. If it points

Listing 1

```
100 '
105 '¶ ____________________________________ ¶
110 '¶   Character Editor for the IBM PC    ¶
115 '¶                                      ¶
120 '¶         copyright (c) 1984           ¶
125 '¶             Steve Rimmer             ¶
130 '¶   Not for commercial distribution    ¶
135 '¶    without the  author's written     ¶
140 '¶     blessing or a signed letter      ¶
145 '¶              from God.               ¶
150 '¶                                      ¶
155 '¶ ____________________________________ ¶
160 CLEAR, &HF000
165 DEF SEG=0
170 POKE &H7C,&H0 : POKE &H7D,&HF0
175 POKE &H7E,PEEK(&H510) : POKE &H7F,PEEK(&H511)
180 DEF SEG
185 DEFINT A-Z
190 J=0 : K=0 : JX=0 : KX=0 : A=51 : B=51
195 SCREEN 1,0
200 COLOR 0,0
205 KEY OFF
210 CLS
215 LINE (1,1) - (319,199),1,B
220 GOSUB 930
225 GOSUB 415
230 GOSUB 470
235 GOSUB 530
240 KEY (1) ON : KEY (2) ON : KEY (3) ON
245 KEY (4) ON : KEY (5) ON : KEY (6) ON
250 KEY (7) ON : KEY (8) ON : KEY (9) ON
255 KEY (10) ON
260 ON KEY (1) GOSUB 315 'CURSOR LEFT
265 ON KEY (2) GOSUB 330 'CURSOR RIGHT
270 ON KEY (3) GOSUB 345 'CURSOR UP
275 ON KEY (4) GOSUB 375 'SET PIXEL
280 ON KEY (5) GOSUB 360 'CURSOR DOWN
285 ON KEY (6) GOSUB 390 'KILL PIXEL
290 ON KEY (7) GOSUB 755 'GET CHR TO SCREEN
295 ON KEY (8) GOSUB 630 'PUT CHR IN MEMORY
300 ON KEY (9) GOSUB 795 'DO DISK OPERATIONS
305 ON KEY (10) GOSUB 405 'END
310 GOTO 240
315 'CURSOR LEFT
320 IF J>0 THEN J=J-1
325 GOSUB 440 : RETURN
330 'CURSOR RIGHT
335 IF J<7 THEN J=J+1
340 GOSUB 440 : RETURN
345 'CURSOR UP
350 IF K>0 THEN K=K-1
355 GOSUB 440 : RETURN
360 'CURSOR DOWN
365 IF K<7 THEN K=K+1
370 GOSUB 440 : RETURN
375 'SET PIXEL
380 PIXEL (J,K) = 1
385 RETURN
390 'KILL PIXEL
395 PIXEL (J,K) = 0
400 RETURN
```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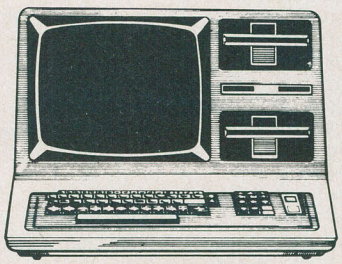

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Character for the IBM PC

```
405 'END THE PROGRAM
410 WIDTH 80 : CLS : END
415 'DRAW THE GRID
420 FOR Y=50 TO 120 STEP 10
425 FOR X=50 TO 120 STEP 10
430 LINE (X,Y) - (X+10,Y+10),2,B
435 NEXT X : NEXT Y : RETURN
440 'PLACE THE CURSOR
445 LINE (A,B) - (A+8,B+8),PIXEL(JX,KX),BF
450 A = 51 + (10*J) : B = 51 + (10*K)
455 LINE (A,B) - (A+8,B+8),3,BF
460 JX=J : KX=K
465 RETURN
470 'DISPLAY THE CURRENT CHARACTER SET
475 LINE (190,20) - (315,180),2,B
480 LOCATE 4,27,0 : PRINT "Current Set"
485 LOCATE 6,30,0 : PRINT "0123456789"
490 FOR Y=128 TO 255 STEP 10
495 LOCATE (((Y-120)/10)+7),25,0
500 PRINT Y;
505 FOR X=Y TO Y+9
510 LOCATE (((Y-120)/10)+7),(30+(X-Y)),0
515 IF X<256 THEN PRINT CHR$(X);
520 NEXT X : NEXT Y
525 RETURN
530 'PRINT COMMAND MENU
535 LINE (5,132)-(175,180),1,B : LINE (6,133)-(174,179),0,BF
540 LOCATE 18,2,0 : PRINT "f1 Right  f2 Left"
545 LOCATE 19,2,0 : PRINT "f3 Up     f4 Set"
550 LOCATE 20,2,0 : PRINT "f5 Down   f6 Unset"
555 LOCATE 21,2,0 : PRINT "f7 Get    f8 Put"
560 LOCATE 22,2,0 : PRINT "f9 Disk   f10 Quit"
565 RETURN
570 'GET CHARACTER INTO ARRAY
575 FOR Y=0 TO 7
580 BYTE(Y) = 0
585 FOR X=0 TO 7
590 IF PIXEL(X,Y) <> 0 THEN BYTE(Y) = BYTE(Y)+ 2↑(7-X)
595 NEXT X : NEXT Y
600 RETURN
605 'GET CHARACTER NUMBER
610 LINE (6,133)-(174,179),0,BF
615 LOCATE 20,2,0 : INPUT "Character";C$
620 C=VAL(C$) : IF C<128 OR C>255 THEN 610
625 RETURN
630 'PUT CHARACTER IN MEMORY
635 GOSUB 570 'GET MATRIX INTO ARRAY
640 GOSUB 605 'ASK FOR CHARACTER NUMBER
645 FOR X=0 TO 7
650 POKE (&HF000+(8*(C-128))+X),BYTE(X)
655 NEXT X
660 GOSUB 530 'PUT MENU BACK
665 GOSUB 470 'UPDATE CHARACTER SET
670 RETURN
675 'SHOW CHARACTER ON THE SCREEN
680 GOSUB 715 'CRACK BYTE INTO PIXELS
685 A=51 : B=51
690 FOR K=0 TO 7 : FOR J=0 TO 7
695 GOSUB 440
700 NEXT J : NEXT K
705 J=0 : K=0 : GOSUB 440
710 RETURN
715 'CRACK BYTE() INTO PIXEL ()
720 FOR Y=0 TO X
725 FOR X=7 TO 0 STEP -1
730 D=BYTE(Y)-(2↑X)
735 PIXEL(7-X,Y) = 0
740 IF D>-1 THEN BYTE(Y)=D : PIXEL(7-X,Y) = 1
745 NEXT X : NEXT Y
750 RETURN
755 'GET CHARACTER INTO ARRAY
760 GOSUB 605 'ASK FOR CHARACTER NUMBER
765 FOR X=0 TO 7
770 BYTE(X) = PEEK(&HF000+(8*(C-128))+X)
```

MDM730 for the Apple!!!

MDM730 is one of the most powerful MODEM7 programs available . . . and the Computing Now! version of MDM730 for the Apple][+ and clones thereof incorporates features not available in the public domain editions. If you are into telecommunications, bulletin boards and downloading software your life will be full and meaningful with this code. Consider the internal trolls.

- Terminal program which works at any baud rate.
- Ten programmable macro function keys.
- Thirty six number phone library.
- Christensen software transfer protocol.
- User settable toggles for line feeds, XON-XOFF and so on.
- Extensive help menus.
- Baud rate selection on the fly (or the spider).
- ASCII dump and capture.
- Status menu
- Many more features.

In addition to all this splendor, however, we've added dialing support for the Apple. While the standard MDM730 cannot dial unless it's hooked to a Hayes Smartmodem, we've added patches to it to allow it to do pin twenty five pulse dialing and to dial through the Hayes Micromodem II and the SSM card. The Computing Now! MDM730 will also

- Select a number from the library and dial it
- Accept a hand entered number and dial it
- Wait for carrier
- Log you onto the remote system if it's free
- Optionally autodial if the remote board is busy.
- Count the number of attempts at dialing the remote BBS.

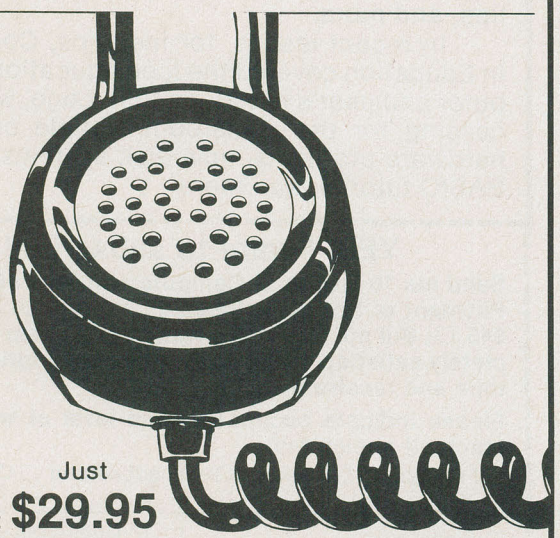
The Computing Now! MDM730 package is available for

- The Hayes Micromodem II.
- The SSM 300 Baud modem card.
- The PDA 232C serial card with external modem.

The PDA 232C package includes versions supporting both the Smartmodem and a dumb modem with pin twenty five line control, such as the Novation AutoCat.

Also included with each package are utilities to permit easy alteration of the phone number library and the function key macro strings plus an extensive documentation file.

The source code file for this program is over a hundred and fifty kilobytes long. It cannot be hacked on a standard Apple. We patched it on a larger machine and downloaded it. As such, we're pretty sure that MDM730 with these features is unavailable elsewhere.



Just
The cost: **$29.95**

Fine Print:
The original MDM730 code is in the public domain. We are offering this part of the program without cost. The charges for this package are for the patches created by Computing Now! and to defer the cost of handling and postage.

This software is guaranteed to work correctly if properly applied. The serial cards must be installed in slot two of an Apple][+ compatible system with at least 48K of RAM running Microsoft CP/M 2.2. The PDA 232C version will require the availability of either a Hayes SmartModem or a modem with pin twenty-five line control to dial. Users of the SSM card version may experience some difficulty in detecting extremely faint carriers on older versions of this card.

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Character for the IBM PC

ing the start of the block plus (ASC(C$)–128)*8, where C$ is the character.

In using the character redefinition capacity of the PC one must first of all decide where the patterns are going to live. The BASIC package provides for the facility of using CLEAR to block off RAM above BASIC's work area... in this case we'll use F000H and above. It's also profound to tell BASIC what memory segment we'll be using... zero, in this case.

Having done this, we must point the PC to the table by storing its location in the registers at 7CH and 7DH... there are two bytes to hold the sixteen bit address.

Now, if bytes are POKEd into RAM from F000H to F008H they'll form the pattern for CHR$(128), the first of the redefinable characters.

Assistant Editors

Turning to listing one, the character editor is a fairly modest BASIC program. It provides a large grid of eight by eight blocks... representing the eight by eight matrix of pixels of a character. The function keys are used to move a cursor around the box and set pixels on or off. Once you get the pattern of pixels the way you want them you can place them in your choice of character positions... the whole works is displayed at the right of the screen and updated whenever you change something.

Completed character sets can be saved to disk and later re–loaded for additional editing or to actually do something with. The short code fragment in listing two can be used to load in a character set and hook it into the operating system from within a program. Thus, for example, you can design a font to hold Sanscrit characters and then use listing two to haul them into memory and set up the pointers and such at the beginning of your Sanscrit word processing program.

A Sanscrit word processor would be a decided gift to humanity and the universe in general. People who write in dead languages have a very poor selection of applications software.

All of the functions of the editor are handled by the system's ten function keys. Their uses are outlined in a menu that's displayed at the bottom of the screen. The squirming mass of KEY statements beginning at line two–forty activate the keys and set them up for use.

Listing 2

```
10 CLEAR, &HF000
20 DEF SEG=0
30 POKE &H7C,&H0 : POKE &H7D,&HF0
40 POKE &H7E,PEEK(&H510) : POKE &H7F,PEEK(&H511)
50 DEF SEG
60 BLOAD "SET1",&HF000
70 END
```

The menu is fairly self explanatory.

Take a Letter

The character definition system of the IBM is extremely flexible. For example, you are not limited to having only a hundred and twenty–eight symbols at your disposal. It's possible to store any number of character sets in RAM and change the pointers to have the PC look at the one you're interested in at the moment.

Character graphics represent the quickest and generally the easiest way to do BASIC animation on the blue beast. While a bit coarse for positioning and such they are quick to place... all you have to do is to PRINT them. We'll be looking at some applications that make use of redefined characters in a future issue.

To begin with, let's try defining all the I's, B's and M's as smiling faces... **CN!**

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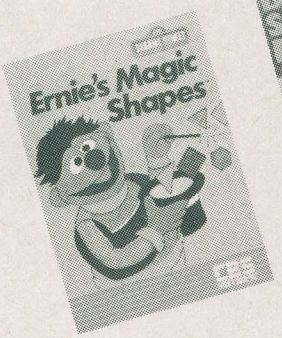

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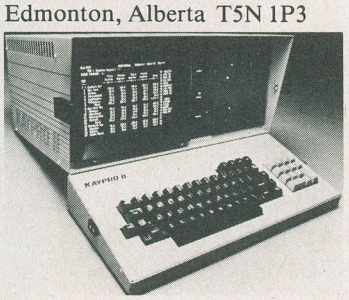

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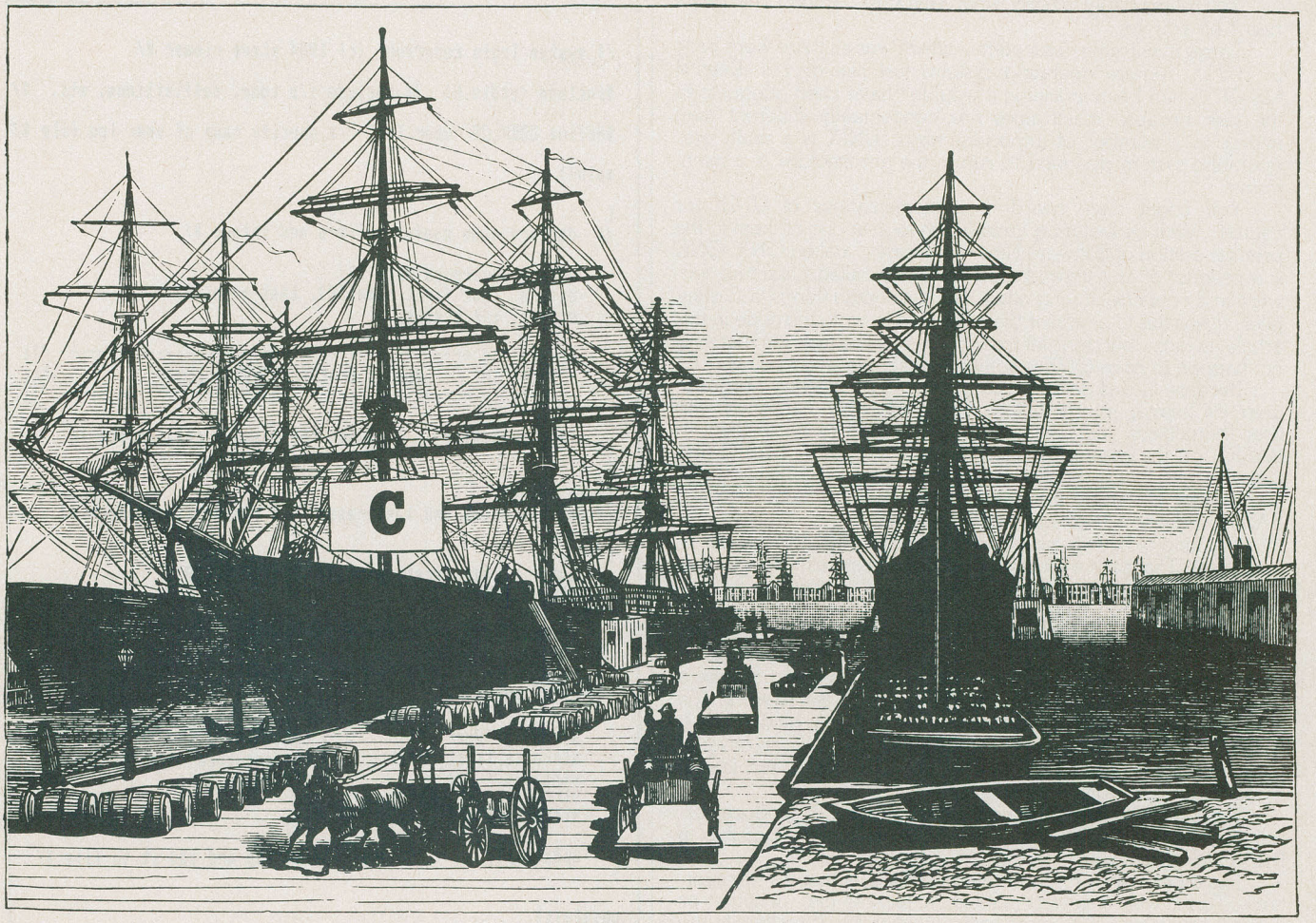
Down To The Ships in C



The C language is like no other... it's a bizarre little tongue unique unto itself. However, its portability, flexible structure and tight results make it attractive despite its lexical peculiarities. Here's an opportunity to get your toes wet.

by Steve Rimmer

Computer languages scurry like small pink eyed rats amongst the feet of technology. They're everywhere. There are specialized languages designed for use in all sorts of areas and general purpose ones for every system on the planet. Some, like PASCAL and BASIC were never really intended by their creators for use as dignified serious programming tools at all.

Some others were designed to be so mind stranglingly serious as to render comatose all but the most ardent programmers who attempted to apply them. One of the most fiendish of these is the heavily mysterious dialect of C.

There are really good programmers who will turn immediately to jelly if you so much as mention C. It's kind of fun to watch, this, and you can usually get a few dozen good sandwiches out of the remains if you're handy with a bread knife. The fact is that C is regarded as being one of the most ill tempered, unapproachable, difficult programming languages ever devised by minions of a large corporate entity.

There're good reasons for this, and, after reading this article you may have cause to believe some of them. However, the advantages of C can far outweigh its drawbacks in many applications. We're going to look at a few of its good points and at several really weird aspects of this bizarre little piece of work.

The Palace UNIX

It's probably worthwhile beginning with the historical stuff. The C language was originally developed by one Dennis Ritchie of Bell Labs in 1972 as a programming tool to assist him and one other Ken Thompson to develop UNIX.

Down To The Ships in C

You're probably asking what UNIX is... good. The coma hasn't hit you yet.

Large mainframe computers... which was all there were back in 1972... require operating systems just like micros. Even if MS-DOS had been available it wouldn't have been adequate to the task because mainframes are conceptually different than micros in a number of important ways. UNIX is a multi user operating system designed to run in the architecture of a mainframe.

You might have heard of implementations of UNIX for micros... we'll be featuring an in depth look at one of them in the premier edition of Software Now! magazine... called QNX. QNX is a product of an Ottawa based company called Quantum software and contains, among other highly splendid things, a C compiler. It was this C compiler that was used to write the code in this article, in fact... but don't let this worry you. The fact you that may not happen to have QNX is actually one of the *good* points of C.

Because C was designed by Ritchie to be used by programmers it's heavily into flexibility and not terribly burdened with user friendliness. Manuals for languages tend to relate them to BASIC, on the assumption that most people know BASIC and that the rest know English, which is nearly the same thing. Manuals for C that do this are a bit pointless... C is nothing like BASIC and doesn't explain well in English.

You kind of have to pick up the vibes, y'know, and just get into the flow. That's not a wholly flippant comment, either... more so than with any other programming language a working understanding of C is very much an intuitive quantity.

Languages like BASIC and PASCAL are very sophisticated translators of human like expressions into machine level code. When you say PRINT in BASIC a couple of hundred... maybe a couple of thousand... bytes of code wake up and get to work. The equivalent in C, a thing called *printf()*, is a tiny little bit of code. It has much of the flexibility of PRINT in BASIC, but it is an order of magnitude more primitive in its ability to handle data and format its work. It's also quite a bit smaller.

This points up the first major advantage of C. It produces extremely fast, tight code. It can do things simply not possible in BASIC for this reason.

The other very profound thing about C is that it's transportable. This is why it doesn't matter... at least to me... whether or not you are using QNX, or even know what it is. It matters to the folks at Quantum, of course, and, if you check out the feature in Software Now! you'll probably come to the blazing realization that it's a really fine thing.

This is only partially germaine to the code that's written using the Quantum compiler. Much the same code could have been done with Supersoft C, Software Toolworks C, BDS C, Lattice C and, in fact, any of a number of other popular C compilers. The whole idea is that C source code written on one system can be moved or, if you want to use one of the technowords, *ported*, to another system, compiled on that machine's C compiler and run all with little or no alteration.

Because C primitives are very much more in keeping with the literal meaning of that term than are those of BASIC or PASCAL, it's a lot quicker and easier to write a C compiler than it would be to do a BASIC interpreter for a new system. In fact, it's become almost traditional for developers of new chips and machines that use them to place C compilers into the public domain shortly after releasing their stuff so that software developers can get cracking on applications code.

This is not to say that all C compilers work exactly the same. There are generally minor differences in the way each treats the standard C library of functions. However, C is as close as anyone has come to a truly portable universal language to date.

Its mobility, coupled with its flexibility and tight results makes C a decent thing to work in. This does not change its sparkling bizarrities one bit though, and, if you've already glanced at the example programs included with this feature you'll probably have realized why towering stacks of abandoned BASICs do not litter our streets and parking lots as people rush out to embrace C.

```
/* system login copyright (c) 1984 steve rimmer */

#include <stdio.h>  /* include i/o code, deffinitions, etc.  */

#define USERLOG "user.log"  /* specify name of user log file */

main()

{
/*  declare some useful buffers and things */

    extern  unsigned date[2];
    extern  char first_name[38], last_name[38];
    extern  int status;

    printf("\n ------------------------------------------ ");
    printf("\n|     Wombat Brothers System Logon          |");
    printf("\n ------------------------------------------ ");

    fetch_names();      /* get the names & call update */
}

fetch_names()
/* get the first and last names into respective buffers */

{
    auto    char first_name[38], last_name[38];
    char s[80];

    printf("\nEnter your first name: ");
    gets(first_name);
    printf("\n           Last name: ");
    gets(last_name);

    strcpy(s,"User: ");       /* concatenate the strings   */
    strcat(s,first_name);     /* copying them into the new */
    strcat(s," ");            /* string... s...            */
    strcat(s,last_name);
    strcat(s,"\n");

    update(s);        /* pass the string and add it to file */
}

update(s)
/* add the user to the user's log */
    char    s[80];
{
    auto    char first_name[38], last_name[38];
    int     c, err;
    FILE    *fp;

    fp = fopen(USERLOG,"a"); /* open the file for appending */
    err = fputs(s,fp);       /* write the string to the file */
    printf("\nUser log updated\n");
    fclose(fp);              /* close the file & split */

}

/* end of log program */
```

UNIXcorns and Other Near Myths

The form of a C program is always that of a collection of nested functions. If you get into UNIX you'll note that this is analogous to the form of a UNIX command path... but don't worry about that just yet.

If you want to get your head around this a bit easier, consider that even the simplest C program consists of at least one user written function. The prime function is always called *main()*. The little brackets after it tell C that it is a function. You can call all the other functions you write anything you like so long as the first one is called *main()*. This is the one which is, in effect, called by the operating system when you run the program.

There are two types of functions from here on. When you

buy the compiler you will get a *standard library* of functions written by the heads that did the compiler. These do the things languages are usually up for providing, such as printing to the screen, getting characters from the keyboard, manipulating stings, handling disk I/O... all the low level stuff.

The other functions you'll have to play with will be the ones you write yourself in the course of developing a program. When one writes a function in C one has all the existing functions to do it with. Thus, a C program is best thought of as a tree, with the most primitive functions... the ones in the standard library... being called by more involved ones called by more involved ones and so on until you reach the meta function, *main()*, which is called by the operating system when you boot the program.

The form of a function is fairly standard... although it looks a bit weird the first time you come upon it. Let's look at the function called *fetch_names()* part way through the first example program *log.c*. The first thing sitting there waving its flag is the declaration of the function's name... with the aforementioned brackets after it. They're empty here, but in many cases they will contain one or more *arguments*, things to be passed to the function as data.

Following the name of the function we encounter the first typographical unpleasantness of C, the opening curly bracket. This means that everything within the outermost pair of curly brackets is a part of the function. More inward pairs of brackets, if any existed... they don't here... would block off portions of the code to be regarded as the province of loops or conditional statements. We'll explore that a bit more fully in a moment.

Having successfully circumnavigated the curly brackets the next port of call is the variable declaration. Unlike as in BASIC, C requires that it be told about any variables you plan on using before you actually get them going. This is called *declaring* your variables. It's a bit like declaring stuff at customs... with similar uncool results if you're caught fibbing.

There are a number of classes of variables in C, of which only a few are used here. Most popular of these are *char*, for character, and *int*, for... predictably... integer. There are also *long* variables, *short* variables, *unsigned* variables and some more specialized ones, which we'll leave for the buzzards in the relentless scorching desert sun. The few we do use will be sufficiently confusing.

The names of variables in C can be anything you like providing that you keep in mind that they are significant to only eight characters. Consider that *aardvark* and *aardvarks* are both the same variable as far as C is concerned as the *s* on the end of latter is the ninth character. C is also selective about case, so, for example, *wombat* and *WOMBAT* are two unique variable names.

Programs in C are traditionally done in lower case, for the most part.

One of the things that bothers many new users about C is the propensity of C programmers to use a lot of underscores. None of the C manuals explain what these things do because, in fact, they don't do anything at all. The underscore character is simply a null character used to join two words to create a more readable variable name. The expression *first name* is illegal under C. You can use *firstname*, but it's a bit awkward. A much better thing is *first_name* ... which is all the underscore actually does.

The variable declaration *auto* is a bit more complicated than the others we looked at. Back up in the *main* of this program I declared a number of *external* variables. These are variables which can be accessed by any function in the program even if they are not passed to said functions through the mysterious brackets after the function's name. However, most C compilers would really be much happier to be told about the existence of any external variables they are going to be expected to access... which is handled by *auto*.

Now, all of the variables in this function happen to be *chars*... but they're weird chars. They are what are called in PASCAL *packed arrays*, something which defines them nicely in C, too. The definition *char c;* implies that C will hold a character. If we enhance this a bit, into *char c[80];*, we are saying that this variable can hold a string of eighty *chars* in a row.

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Down To The Ships in C

```
/* view a disk file on the screen with paging */
/* copyright (c) steve rimmer */

#include <stdio.h>

#define     BEL 07
#define     FF  12

main(argc,argv)  /* this gets arguments from the command */
int argc;        /* line. if it is a sour mood it tell them */
char *argv[];    /* to shut up and go strangle a cat        */
{
    FILE *in;
    int c, i;

    cls();

i = 1;
if((in = fopen(*++argv,"r")) != NULL)  /* if the file exists... */
    {
    while ((c = getc(in)) != EOF)      /* get a character... */
        {
        putc(c,stdout);                /* and fling it to the screen */
        if ( c == '\n')                /* if it's a carriage return */
            {
            ++i;                       /* bump up counter */
            if (i == 24)               /* if 24 lines have */
                {                      /* screamed by */
                page();                /* pause for a Coke */
                i = 1;                 /* and stomp the counter */
                }
            }
        }
    fclose(in);                        /* finally, close the file */
    }                                  /* and put it to bed */
else

        printf("Tilt... that file is not in this dimension.\n");
}

page()
/* stop print and wait for life at keyboard */

{
    int c;

    toot();                            /* sound the chimes */
    printf("[ Hit RETURN for more ]");
    c = getc(stdin);                   /* wait for carriage return */
    printf("\n");
}

cls()
/* clear the screen */

{
    putchar(FF);
}

toot()
/* sound the bell */

{
    putchar(BEL);
}


/* end of view program */
```

It's probably worth mentioning the semi-colons around about now, having just slung a couple of them into the party. These aren't as mysterious as they seem... C likes to know when you have ended a logical line, as this is frequently not the same as the end of a line of text. This is handled by tacking a semi-colon onto the end of each complete statement.

The Nuts and Bolts

Having browsed through the catalog of impending variables in the *fetch_names()* function we now get to a block of four function calls. These four are all primitives, that is, they come pre-written for us by the provider of the compiler. These two are heavily profound. The *printf* function is analogous to the BASIC PRINT, although, as we'll see, it is used rather differently. The *gets* bit is something like INPUT.

The syntax of *printf* is quite sophisticated... it's rather more involved than virtually any other C function. The use here is fairly simple. We'll speak with some more enlightened manifestations of it shortly. In this case, everything between the quotes will get printed... except for the backslash *n*.

It's useful, in C, to represent certain characters as what are called backslash or escape sequences. Among these are n, for *newline* and t, for *tab*. These things can be placed within quoted strings and they'll still print their meanings rather than a literal backslash and a character.

The next bit after the *printf*'s and *gets*'s is a humming nest of string manipulation functions. *strcpy()* copies one string into another and *strcat* concatenates... adds together... two strings. This may take a bit of getting used to, as BASIC programmers will be used to simply using the equal sign to get this together.

In fact, you can just say *string1 = string* in C, but it doesn't have the meaning one would expect. You see, the variables in C do not really represent the data that is assigned to them. They are actually *pointers*. If you were to assign the variable *treetoad* the string "small green eyed frogs" what *treetoad* would actually hold would be a memory address which would hold the first byte of the string. Thus, saying that *treefrogs = treetoads* would simply make the two pointers equal. Adding two strings together in this way would add the two *pointers* together, making the result point to some other, most likely meaningless, section of memory.

The *strcat* function, then, copies its second string onto the end of its first string... a very different thing.

Finally, this function contains another function call. This last function is one that I wrote with my own flying fingers... it appears directly below. Note that we are passing the function something, to wit, the string *s*. The string is properly an argument.

The function closes off with a right curly bracket, indicating that the performance is over.

The Real World

Having looked at some of the basics of let's now turn to these example programs. While none of them are particularly simple taken as entities, they are comprised of simple bits. This is the nature of C. Understanding them should give you a fairly decent insight into what's happening in C as a whole.

Since we've looked at program one, *log.c* in some detail, let's check out its operation. This routine is a log on for a multi-user system or, with a bit of work, for a bulletin board. It asks for the user's first and last names and adds them to a log file.

Having looked at how C works understanding the first two parts of this program should be fairly straight up. Note that it consists of three functions each calling the one below it... this is a fairly simple structure. Most C programs get much more involved than this.

The first thing in the program, even before the *main()*, is a pair of instructions to the compiler. The first thing we do is to *#include ◄stdio.h►*. This means that the compiler is to suck in this file, stdio.h, and pretend that it is where this directive lives in the text file. In fact, this file contains all the code which is needed by the compiler to handle screen and disk I/O... the function *printf*, for example, lives in there. It's provided as part of the compiler and *#include*d in virtually every program.

The *#define* directive allows us to concoct *labels* and assign them fixed values which are plopped into the code whenever the compiler encounters subsequent occurrences of the label. Labels are traditionally upper case to avoid confusing them with other C keywords.

In this case, we have assigned the label USERLOG the string 'user.log', a legal file name under both UNIX and CP/M. You can think of this as a search and replace thing... whenever the C compiler locates the label USERLOG it will replace it with "user.log".

The lines which are enclosed in these little gophers, /* */, are comments. The compiler ignores them. In a trackless language like C profuse comments can be the only thing keeping you from wandering off into the jungle and becoming lost for all time.

The *update()* function is probably a fairly nasty thing to get into as an early example of C programming. It handles a disk file, usually a reasonably unpleasant thing in any language. Notice, however, that while this function is really headbending to look at in C at least it's really short.

The first thing we encounter in *update()* is a variable declaration. Check out its location... it occurred outside the curly brackets. This is important... it declares a variable which is passed to the function as an argument, rather than one which is being created for use within the function. These latter ones would be declared within the brackets.

There's a new variable type here, too, called *FILE*. It is, not surprisingly, a file name. Note, however, the inscrutable presence of the asterisk before the variable name, *fp*, that it's declaring.

```
/* time program for UNIX on PC     */
/* copyright 1984 (c) steve rimmer */



#include <stdio.h>
#include <timer.h>

#define SCR_VERT 24         /* this is a bunch of defines that */
#define SCR_HOR  80         /* are freqently useful in assorted */
#define LF       10         /* c programs. only the last one is */
#define CR       13         /* used in this one. It's handy to  */
#define BEL      07         /* keep 'em all in a file and read  */
#define BS       08         /* then in when you start a program. */
#define TAB      09         /* it's even slicker to put them in  */
#define CRT      28         /* a .h file and #include them.      */
#define CLT      29
#define FF       12
main()


{
  unsigned    date[2];
  int         day, month, year, hour, min, sec, am_pm;

  cls();      /* clear the screen */
  get_date(date);  /* QNX library function... see text */

  day     =   (date[0] >> 1) & 0x3f;  /* this fearsome stuff */
  month   =   (date[0] >> 8) & 0xf;   /* decodes the time and */
  year    =   date[0] >> 12;          /* date from the value  */
  hour    =   date[1] / 3600;         /* returned by get_date */
  min     =   (date[1] % 3600) / 60;  /* other uses of get_date */
  sec     =   date[1] % 60;           /* are to have it find you */
  am_pm   =   date[0] & 0x1;          /* someone to go to the    */
                                      /* flicks with             */
  printf("Date: ");

  switch(month) /* pick one of the following actions depending */
  {             /* on the value in the variable month          */
  case 1 :
      printf("January ");
      break;
  case 2 :
      printf("February ");
      break;
  case 3 :
      printf("March ");
      break;
  case 4 :
      printf("April ");
      break;
  case 5 :
      printf("May ");
      break;
  case 6 :
      printf("June ");
      break;
  case 7 :
      printf("July ");
      break;
  case 8 :
      printf("August ");
      break;
  case 9 :
      printf("September ");
      break;
  case 10 :
      printf("October ");
      break;
  case 11 :
      printf("November ");
      break;
  case 12 :
      printf("December ");
      break;
  }

  if (month != 0)
      {
      printf("%d,%d\n",day, (year + 1980));
      }
      printf("Time: %d:",hour);
      pad(min);
      printf(":");
      pad(sec);

      switch(am_pm)
      {
      case 0 :
          printf(" am\n");
          break;
      case 1 :
          printf(" pm\n");
          break;
      default :
          printf("\n");
          break;
      }
  }
  pad(v)
  /* print out two digit value with leading zero */

  {
      if (v < 10)
          {
          printf("0");
          }
      printf("%d",v);
  }

  cls()
  /* clear the screen */

  {
      putchar(FF);
  }

  toot()
  /* sound the bell */

  {
      putchar(BEL);
  }


  /* end of time program */
```

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Down To The Ships in C

This means that the name is implicitly a pointer to the string *fp*. In other words, if the string were to be *"user.log"*, printing *fp* would return *user.log* while printing **fp* would return a memory address.

The first function in the program opens the file contained in USERLOG for appending... that's what the *"a"* means. It returns a value in *fp* which points to the file name stored in memory. The function *fputs* places the string held in *s*... the user's name generated by *fetchnames()* a minute ago... in the next available part of the file. Finally, *fclose(fp);* closes the file.

Further Reality

The next example, *view.c*, will take a disk file name as an argument and type it on the screen, pausing every twenty-four lines. This is analogous to the TYPE command in CP/M and MS-DOS. The first important thing here, however, is how to get arguments from the command line.

The form *main(argc, argv)* is the standard form for handling command line arguments in C. *argc* returns the number of arguments and *argv* the arguments themselves. These variables are declared outside the curly brackets of *main()* because C regards them as being passed parameters.

You'll probably notice a superabundance of curly brackets in this program. As we noted before, these are used to contain the code that is executed by loops and conditionals. The first set contains the code to be blasted through if the file name pointer, *in*, doesn't point to a NULL character, which would be C's way of saying that the file couldn't be found. The next one is for the following *while()* loop. This means, literally, "while you get characters in from the file pointed to by *in* and they don't equal the EOF, or end of file character, do all the stuff inside the next set of curly brackets and loop to check again". It's quite a mouthful.

The other unusual operators herein are + + and = =. These are not the result of keyboard bounce but, rather, are quite meaningful to C.

It's very often the case that one wants to increment or decrement a value interactively. In BASIC one normally says X = X + 1, or something along these lines. C allows for it by going *+ +x;* to increment *x* and *— —x* to decrement it.

Likewise, in BASIC the equal sign operator serves both to assign and test equality. In C, testing if something is equal or unequal requires the use of a two character operator. Thus, to see if x equals twenty-one we would say *if (x = = 21)*. The operator for inequality is *! =*.

The final example program is actually pretty straightforward. However, it's a good instance of a real world utility written in C. Much of it is specific to the QNX implementation of C. However, it's included here because it's good exercise in modifying code to suit your needs. It reads the system's clock and displays the results on your screen.

First off, we have a block of *#defines*. In fact, these are not all needed for the program... only the last one is actually used. However, they create no additional code and, in an effect to implement satisfactory amounts of programming sloth in an otherwise precise and sterile environment I usually keep this sort of stuff in a file and inhale into the program I'm working on whenever I start one.

The *get_date()* function and the code which immediately follows it returns the system's clock contents in two bytes and then cracks it apart so it can be represented in human terms. The function itself is in the QNX library... you'll probably have to write it for your system, as your implementation of C will very likely not support your clock. Likewise the cracking apart code will also want changing.

The next structure in the program is one of C's most powerful functions. The *switch()* statement allows for multiple branches depending on the contents of the variable it's testing. The *switch* also allows for a condition called *default* which it will branch to if none of the explicit conditions are met.

This program also illustrates the full use of *printf*. Immediately after the long switch structure you'll notice the line

printf("%d,%dn",day,(year+1980));. This means to print the string passed to *printf* substituting the values of the variable *day* for the first control string and *year* plus 1980 for the second. The control strings are the percent signs followed by characters. The string "%d" means to display the value as a decimal number. We could have said "%x", for hexadecimal or "%o" for octal. The string "%s" is also common to indicate a character string.

C For Miles

It's impossible to provide a complete tutorial on C in a single article... it's pretty tricky to handle it in human terms in a single book. C is a supremely powerful language because it gives the programmer complete control over the system. This, however, also implies that one has the responsibility to use all this control properly. C does fairly little hand holding and error checking when compared with BASIC.

C is also rotten with abbreviations and shorthand. It makes its compilations fast and its code tight... but it also calls for a lot of mental translating as you get into it.

If you begin to work with C you'll probably discover that it's wonderfully flexible and resourceful despite its largely martian syntax. It's splendid for writing large applications in as it's inherently structured and, as such, fairly easy to debug in sections. It lends itself to libraries of user written code without requiring a lot of program overhead to use 'em.

Finally, there's that glowing feeling that C gives you, the pride you'll feel in having conquered something truly nasty. If you can hack your way though the tangled vines and creepers of C you can probably handle anything.

The fuming jaws and writhing coils await...

For further reading check out...

The C Programming Language *by Brian W. Kernighan and Dennis M. Ritchie, published by Prentice Hall. This is the standard reference work on C, and serious as taxes.*

C Primer Plus *by Mitchell Waite, Stephen Prata and Donald Martin, published by Sams. This is a much thicker book than Kernighan and Ritchie, but much easier to get through.*

The C Primer *by Les Hancock and Morris Krieger, Published by McGraw Hill. This is largely a rewrite of Kernighan and Ritchie, with a bit less information and a neater cover.* **CN!**

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Stockboy Menu

At long last, Stockboy becomes history. Don't miss this end of an era.

by Robert J. Thorne

It has been said that all good things must come to an end; the Stockboy inventory control package seems to be no exception. The first four modules... inventory entry, point-of-sale, reports, and utilities... have already appeared in the December 1983, January, June, and July 1984 issues, and this final module, the main menu, serves only to tie the other three together.

Elsewhere in this issue should be the usual ad about getting this all on a disk and saving your fingers the agony of keying in all five programs. Other than that, that's all.

Soup... there are millions of cans of soup...

```
10 '-------------------------------------------------------'
20 '    INVENTORY MAIN MENU MODULE VERSION 2.4             '
30 '    COPYRIGHT (c) 1984 STEVE RIMMER AND ROBERT J. THORNE '
40 '    Not For Sale Without The Authors' Permission       '
50 '    ...available on disk...  for more information     '
60 '    contact CN!, 25 Overlea Blvd, Unit 6, Toronto     '
70 '    Ontario M4H 1B1 (416)-423-3262                    '
80 '-------------------------------------------------------'
90 DEFINT A-Z
100 CR$= CHR$(13) 'CARRIAGE RETURN
110 LF$=CHR$(10)  'STRING TO MOVE DOWN ONE LINE
120 BS$=CHR$(8)   'KEY TO INTERPRET AS BACKSPACE
130 RUB$=CHR$(8)+" "+CHR$(8) 'STRING TO DELETE A CHARACTER
140 CLS$=CHR$(27)+"*" 'STRING TO CLEAR SCREEN
150 HM$=CHR$(30) 'STRING TO HOME CURSOR
160 FF$=CHR$(12) 'STRING TO FORM FEED ON PRINTER
170 ALP$=" ABCDEFGHIJKLMNOPQRSTUVWXYZ:;+][-
    1234567890)(*&%$#@!.,?'"
180 UP$=CHR$(5)  'KEY TO INTERPRET AS CURSOR UP
190 DN$=CHR$(24) 'KEY TO INTERPRET AS CURSOR DOWN
200 XX$=CHR$(25) 'KEY TO INTERPRET AS CLEAR THE LINE
210 CON$=UP$+DN$+CR$
220 LI$=" "+STRING$(78," ")
230 NUM$="0123456789."+BS$+CON$+XX$
240 GOTO 560
250 'LINE ENTRY FUNCTION
260 'NEEDS MAXIMUM LENGTH OF ENTRY IN ENT
270 'NEEDS SCREEN LINE NUMBER IN LNE
280 'NEEDS TITLE IN TITLE$
290 A$=""
300 PRINT HM$;
310 PRINT STRING$(LNE,LF$);
320 PRINT TITLE$": [" STRING$(ENT,32) "]" CR$ TITLE$": [" DAT$
    CR$ TITLE$": [";
330 IF PASS0=0 THEN 460
340 C$=INPUT$(1)
350 IF ASC(C$)>ASC("Z") THEN C$=CHR$(ASC(C$)-&H20)
360 WID=LEN(A$)
370 CON=INSTR(CON$,C$)
380 FULL=ENT=WID
390 FLAG=INSTR(ALP$,C$)
400 IF NUM=1 AND INSTR(NUM$,C$)=0 THEN 340
410 IF FLAG AND NOT FULL THEN PRINT C$; : A$=A$+C$ : GOTO 340
420 IF C$=BS$ AND WID>0 THEN PRINT RUB$; : A$=LEFT$(A$,WID-1)
    : GOTO 340
430 IF C$=XX$ THEN PRINT STRING$(WID,RUB$) STRING$(WID," ")
    STRING$(WID,RUB$); : A$="" : GOTO 340
440 IF CON THEN 460
450 GOTO 340
460 NUM=0
470 IF WID=0 THEN 490
480 IF PASS0=1 THEN DAT$=A$+STRING$((ENT-WID)," ")
490 RETURN
500 ' DO TITLE
510 IF LEN(TITLE$)<78 THEN TITLE$=" " + TITLE$ + " " : GOTO
    510
520 PRINT CLS$;
530 PRINT TITLE$
540 PRINT LI$
550 RETURN
560 REM MAIN ROUTINE
570 TITLE$="STOCKBOY MAIN MENU PAGE" : GOSUB 500
580 TITLE$="Function: Entry, Sales, Reports, Utility"
590 DAT$="S" : PASS0=1 : ENT=1 : LNE=20 : GOSUB 250
600 IF DAT$="E" THEN RUN "STOCK"
610 IF DAT$="S" THEN RUN "POINTX"
620 IF DAT$="R" THEN RUN "REPORT"
630 IF DAT$="U" THEN RUN "UTILITY"
640 GOTO 560
```


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Additional copies of these issues will be available on a bulk copy basis and orders should be forwarded now to the Circulation Manager of each publication. For advertising space reservations contact should be made immediately with Omar Vogt, Rick May, or Claire Zyvitski at (416) 423-3262. Time is of the essence to avoid disappointment.

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Sincerely,

Halvor Moorshead.

Halvor W. Moorshead,
Publisher

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CP/M's Good Host

Having more than one user on your single user micro... without a lot of squabbling over who gets to sit where... is a challenge. Vanquishing the foe is a job for the CP/M Host program. Check out the code... and the banners waving in the breeze.

by Steve Rimmer

I really love the idea of local area networks and multi user systems. They get over a number of the hassles inherent in microcomputers. We could use 'em here... it would save quite a number of people the daily strain of walking around with disks in their hands and stunned looks on their faces as they quest for drives. The computer typesetter wouldn't have to be run through an Apple clone and it might even be possible to save the three or four hapless victims of paper avalanches that leave the place feet first each year.

Death by memos is a horrible fate.

In a more enlightened sense, having more than one user for a computer allows multiple humans to access the same data or the same software without a lot of desk shuffling. Now, LANs are great for this... but they are a tad expensive. A local area network, even a modest one, can cost considerably more than the hardware it interconnects.

This is not to say that the green eyed little gaffers aren't worth every cent of what they cost. However, in many cases even a small LAN is more than one needs. A lot can be done to make one's available computer power more accessible by simply hanging a second terminal off the machine.

The CP/M Host program we're going to be looking at after this introduction winds down in a paragraph or two is a fairly sophisticated bit of code which interfaces an external terminal though your computer's serial port to the operating system's BIOS. To revert to crude English for a moment, it makes your computer think that it's talking to its keyboard and screen when, in fact, it's conversing with both the local hardware and the terminal.

Someone parked in front of the terminal, be it across the room or on the other side of the building, can operate the computer as if he, she, or it were right there staring it in the face.

While this is not as good as a LAN or a multi user system, it is powerful. To be sure, users of this type of arrangement will want to make sure that two sets of fingers don't go dancing over the keys at the same time. However, in many cases it will solve the need for the computer to be in two places at once. It also might save you some walking.

Interfacing a robot arm to the thing to allow you to change disks from far away will, of course, have to be left to the individual programmer.

Ramblin' Code

The program in listing one is the source for the whole Host system. It looks wicked, and with good reason. This is a really heavy example of that sloe eyed gremlin we have encountered on past occasions, relocating code.

If you haven't had the pleasure an introduction may be in order. Relocating code is a bunch of bytes which are assembled so as to have all their fixed addresses point to somewhere else. To look at this another way, consider this program.

```
        ORG     0100H
        MVI     C,9
        LXI     D,ADDR
        CALL    BDOS
        RET
ADDR    DB      'Cats do not fly well$'
        END
```

This will load and run at 0100H, like most programs. Now check out this one.

```
        ORG     0F000H
        MVI     C,9
        LXI     D,ADDR
        CALL    BDOS
        RET
ADDR    DB      'Unless you throw them$'
        END
```

Actually, this is a trick question. This won't even load because the linker will want to create a massive COM file stretching up to F000H, which, of course will not fit in memory and very possibly not on your disk, as well.

Now, the Host does have to live up in high memory. If we were to assemble it like regular code down at the bottom of the TPA and then just move it it would try to jump back down to where it was assembled to go. Since the Host is intended to run behind other applications this would result in some really mind warping crashes.

The solution to this is to write code that assembles to live in the TPA but with addresses that point up into high memory. It's possible to fool the assembler into doing this if you write the labels of the form

LABEL EQU $+OFFSET

as is done in the Host source.

Code thus assembled can be moved into place. Relocating programs usually take the form of a block of relocatable code and a mover... MOVE in this case. The Host also requires a routine to fool CP/M into thinking that the implant is part of it, called RESVEC here.

Up On High

Having seen how the Host code is tooled about let us now consider what it does.

Whenever a piece of software wants to, say, get a character from the keyboard it does a BDOS call. The BDOS, in turn, looks up what is called the BIOS jump table. As we've seen in past issues of Computing Now!, the beginning of the BIOS jump table can always be found by looking at location zero of the system's memory. This contains a JMP to the base of the table. The entries are always in the same order, so the BDOS... and any other software that cares to mess with it... knows how to get a character. It simply calls the appropriate BIOS table jump.

In order to implement the Host what we need to do is to make the computer look to both the keyboard and the serial port whenever it decides to troll for characters. Furthermore, it has to do this dual input for both system commands and for applications software. As such, the BIOS jump table will want altering.

Breaking the process down even further, we want to add an extra step in processing the BIOS call to get a character. Instead of simply going and looking for keyboard status we want to look for serial status too. As such, we must alter the jump in the BIOS table to point to some new code that handles these two functions and then gets a character from whichever source happens to have one.

This code, of course, is the part of the host that scrambles up into high memory. It lives above the TPA where it can't be overwritten by transient programs. We'll get to likely homes for it presently. When you run Host the mover moves it and the patcher alters the jump table so that calls for console status, input and output go to it, rather than to the real BIOS routines.

The Host will call the real BIOS routines as it needs them.

In fact, to make system programming easier, the Host maintains a sort of BIOS jump table of its own. This does not offer the same functions as the real BIOS, which is still active for disk I/O and other peripheral communications. Rather, the *mini BIOS* allows programmers access to the facilities of the Host code for utility programs that work with both the local and the remote terminal.

The mini BIOS intercepts the vectors for the console status, input and output calls, with the console status being the first. Thus, the mini BIOS can be located by a program by finding the location of the real BIOS, this being, in fact, the warm boot vector, and moving up three locations to the console status vector. This will point to the start of the Host code after HOST.COM has been run.

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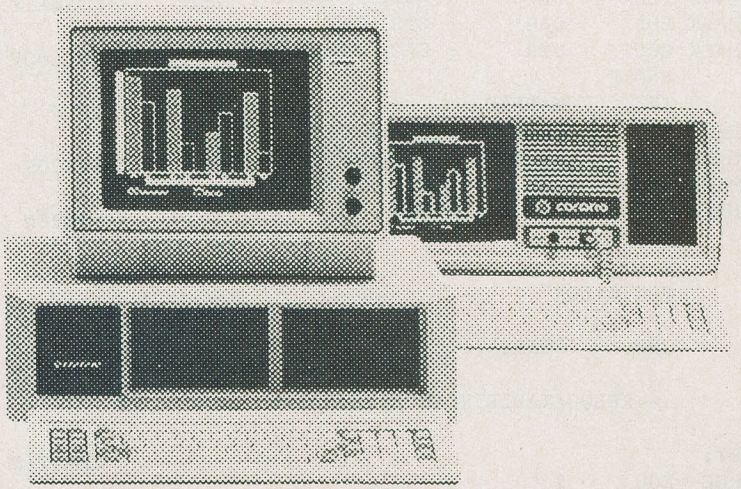

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CP/M's Good Host

```
;.....................................;
;
;            HOST Version 1.00
;       A Remote Console Implimentation
;       Copyright 1984 (c) Steve Rimmer
;       May require patching for use in
;       Kamloops, B.C. after 4:00 pm on
;       Sundays in July
;
;.....................................;

DEST    EQU     0FC00H  ;WHERE CODE WILL LIVE
SPEED   EQU     4       ;CLOCK SPEED IN MHZ
CLS     EQU     26
CR      EQU     13
LF      EQU     10
YES     EQU     0FFH
NO      EQU     0
PORTED  EQU     YES     ;PORTED I/O
MAPPED  EQU     NO      ;MEMORY MAPPED I/O
;
        IF      PORTED
MODDATP EQU     0F5H    ; MODEM DATA PORT
MODCTLP EQU     0F7H    ; MODEM CONTROL PORT
SNDMASK EQU     04H     ; CTS MASK
RDYMASK EQU     01H     ; DATA READY MASK
        ENDIF
        IF      MAPPED
MODDATP EQU     0E0A8H  ; MODEM DATA PORT
MODCTLP EQU     0E0ADH  ; MODEM CONTROL PORT
SNDMASK EQU     20H     ; CTS MASK
RDYMASK EQU     01H     ; DATA READY MASK
        ENDIF
;
        ORG 0100H
;
        JMP     START
;
;       +++RELOCATABLE HOST BITSIES+++
;
RSTRT:
SOURCE  EQU     $
OFFSET  EQU     DEST-SOURCE
;
;       +++HOST MINI-BIOS+++
;
LOCSTAT EQU     $+OFFSET
        JMP     VLOCST          ;CONSTAT
LOCIN   EQU     $+OFFSET
        JMP     VLOCIN          ;CONIN
LOCOUT  EQU     $+OFFSET
        JMP     VLOCOUT         ;CONOUT
STATV   EQU     $+OFFSET
        JMP     $-$             ;LOCAL CONSTAT
INV     EQU     $+OFFSET
        JMP     $-$             ;LOCAL CONIN
OUTV    EQU     $+OFFSET
        JMP     $-$             ;LOCAL CONOUT
REMSTAT EQU     $+OFFSET
        JMP     VRMSTAT         ;REMOTE CONSTAT
REMIN   EQU     $+OFFSET
        JMP     VRMIN           ;REMOTE CONIN
REMOUT  EQU     $+OFFSET
        JMP     VRMOUT          ;REMOUT OUT
REMCTS  EQU     $+OFFSET
        JMP     VRMCTS          ;REMOTE CTS
REMSEND EQU     $+OFFSET
        JMP     VLOUT2          ;REMOTE CTS & SEND
SWAIT   EQU     $+OFFSET
        JMP     WAIT            ;WAIT
DPRINT  EQU     $+OFFSET
        JMP     DPRN            ;PRINT DUAL
RPRINT  EQU     $+OFFSET
        JMP     RPRN            ;PRINT REMOTE
LPRINT  EQU     $+OFFSET
        JMP     LPRN            ;PRINT LOCAL
;
;       +++HOST CONFIGURATION BYTES+++
;
TERMON  EQU     $+OFFSET
        DB      YES     ;YES = DEFAULT HOST ON
SENDNUL EQU     $+OFFSET
        DB      YES     ;YES = NULLS AFTER CR
NUMNULS EQU     $+OFFSET
        DB      0AH     ;NUMBER OF NULLS TO SEND
CTSWAIT EQU     $+OFFSET
        DB      0AH     ;# OF MSECS TO WAIT ON CTS
CTSLOOP EQU     $+OFFSET
        DB      128     ;MAX NUMBER OF CTS LOOP
CRLF    EQU     $+OFFSET
        DB      NO      ;SEND LF AFTER CR
PRNCON  EQU     $+OFFSET
        DB      YES     ;YES = PRINT TO CONSOLE
PRNREM  EQU     $+OFFSET
        DB      YES     ;YES = PRINT TO REMOTE
;
;       +++ACTIVE HOST CODE+++
;
        IF      PORTED
VRMIN   EQU     $+OFFSET
        IN MODDATP ! ANI 7FH ! RET ;REMOTE CONIN
;
VRMSTAT EQU     $+OFFSET
        IN MODCTLP ! ANI RDYMASK   ;REMOTE CONSTAT
        CPI RDYMASK ! RET
;
VRMOUT  EQU     $+OFFSET
        OUT MODDATP ! RET          ;REMOUT CONOUT
;
VRMCTS  EQU     $+OFFSET
        MOV     B,M     ;SET NUMBER OF LOOPS
REML    EQU     $+OFFSET
        CALL    REMCTS  ;CLEAR TO SEND?
        JZ      READY   ;IF SO, DO IT
        PUSH    B       ;SAVE B
        LXI     H,CTSWAIT
        MOV     B,M     ;GETWAIT FOR CTS
        CALL    WAIT    ;WAIT
        POP     B       ;RESTORE B
        DCR     B       ;COUNT
        JNZ     REML    ;...DOWN AND
        MOV     A,C     ;...QUIT IF
        RET             ;...NOT READY
```

```
;
READY   EQU     $+OFFSET
        MOV     A,C     ;SEND CHARACTER TO
        CALL    REMOUT
        CPI     CR
        CZ      SNDNUL
        RET
;
WAIT1M  EQU     $+OFFSET
;1 MSEC DELAY
        PUSH    B
        LXI     B,41*SPEED
SWAIT1  EQU     $+OFFSET
        DCX     B
        MOV     A,B
        ORA     C
        JNZ     SWAIT1
        POP     B
        RET
;
WAIT    EQU     $+OFFSET
;WAIT 1MS * B
        PUSH    B
        CALL    WAIT1M
        POP     B
        DCR     B
        JNZ     WAIT
        RET
;
SNDNUL  EQU     $+OFFSET
        LDA     CRLF    ;DO WE WANT LF
        CPI     NO      ;PROBABLY NOT
        JZ      NOLF    ;SO GO ON
        MVI     C,LF    ;OTHERWISE, SEND
        JMP     REMSEND ;THE SNIVELING LINE FEED
NOLF    EQU     $+OFFSET
        LDA     SENDNUL ;NULLS REQUIRED?
        CPI     NO      ;IF NOT
        RZ              ;BEGONE, GO AWAY, SCRAM
        LXI     H,NUMNULS       ;
        MOV     B,M     ;GET NUMBER OF NULLS
NULP    EQU     $+OFFSET
        IN MODCTLP ! ANI SNDMASK   ;REMOTE CLEAR
        CPI SNDMASK ! RET
        ENDIF

        IF      MAPPED
VRMIN   EQU     $+OFFSET
        LDA MODDATP ! ANI 7FH ! RET ;REMOTE CONIN
;
VRMSTAT EQU     $+OFFSET
        LDA MODCTLP ! ANI RDYMASK  ;REMOTE CONSTAT
        CPI RDYMASK ! RET
;
VRMOUT  EQU     $+OFFSET
        STA MODDATP ! RET          ;REMOUT CONOUT
;
VRMCTS  EQU     $+OFFSET
        LDA MODCTLP ! ANI SNDMASK  ;REMOTE CLEAR
        CPI SNDMASK ! RET
        ENDIF
```

```
;
VLOCST  EQU     $+OFFSET
        LDA     TERMON  ;IF HOST IS OFF, JUST
        CPI     NO      ;DO A LOCAL CONSTAT
        JZ      STATV
        CALL    REMSTAT
        JZ      RSTAT   ;IF YES, RETURN
        JMP     STATV
RSTAT   EQU     $+OFFSET
        MVI     A,0FFH
        RET
;
VLOCIN  EQU     $+OFFSET
        LDA     TERMON  ;IF HOST IS OFF JUST
        CPI     NO      ;DO A LOCAL CONIN
        JZ      INV
        CALL    REMSTAT
        JZ      RINP    ;IF YES, GET IT
        CALL    STATV   ;CHECK LOCAL STATUS
        CPI     0       ;0 IF NO CHAR
        JZ      VLOCIN
        JMP     INV     ;GET CHAR
RINP    EQU     $+OFFSET
        CALL    REMIN   ;GET REMOTE CHARACTER
        MOV     C,A
        RET
;
VLOCOUT EQU     $+OFFSET
        PUSH    B       ;SAVE CHARACTER
        CALL    OUTV    ;SEND IT LOCAL
        POP     B       ;GET CHARACTER
        LDA     TERMON  ;IF HOST IS OFF JUST
        CPI     NO      ;DO A LOCAL CONOUT
        RZ
VLOUT2  EQU     $+OFFSET ;SEND IT REMOTE
        LXI     H,CTSLOOP
        PUSH    B       ;PRESERVE COUNT
        MVI     C,0     ;PUT A NULL IN C
        CALL    LOCOUT  ;SEND IT TO HEAVEN
        POP     B       ;SNATCH THE COUNT
        DCR     B       ;SLICE IT
        JNZ     NULP    ;LOOP TILL WEARY
        RET
;
IPRN    EQU     $+OFFSET ;IN LINE PRINT
        XTHL
IPLP    EQU     $+OFFSET
        MOV A,M ! ORA A ! JZ IPRET
        CALL IOPRN ! INX H ! JMP IPLP
IPRET   EQU     $+OFFSET
        XTHL
        XCHG            ;GET OLD STATUS
        SHLD    PRNCON  ;BACK AGAIN
        RET
;
IOPRN   EQU     $+OFFSET
        PUSH H ! PUSH D ! PUSH B
        STA     CURCH
        LDA     PRNREM
        CPI     YES
        CZ      SHOWREM
```

```
        LDA     PRNCON
        CPI     YES
        CZ      SHOWLOC
        POP B ! POP D ! POP H
        RET
;
CURCH   EQU     $+OFFSET
        DS      1
;
SHOWREM EQU     $+OFFSET
        LDA CURCH ! MOV C,A ! CALL REMSEND
        RET
;
SHOWLOC EQU     $+OFFSET
        LDA CURCH ! MOV C,A ! CALL OUTV
        RET
;
RPRN    EQU     $+OFFSET
;PRINT TO REMOTE CONSOLE ONLY
        LHLD    PRNCON  ;GET CURRENT STATUS
        XCHG            ;IN D
        LXI     H,0FF00H ;SET UP STATUS
        SHLD    PRNCON
        JMP     IPRN    ;PRINT
;
LPRN    EQU     $+OFFSET
;PRINT TO LOCAL CONSOLE ONLY
        LHLD    PRNCON
        XCHG
        LXI     H,00FFH
        SHLD    PRNCON
        JMP     IPRN
;
DPRN    EQU     $+OFFSET
;PRINT TO BOTH
        LHLD    PRNCON
        XCHG
        LXI     H,0FFFFH
        SHLD    PRNCON
        JMP     IPRN
;
RELEND:
;
;       +++HOST PATCHING IN CODE+++
;
START   LXI H,0 ! DAD SP ! SHLD STACK
        LXI    SP,STACK
;
        CALL    MOVE    ;PUT HOST IN ITS HOLE
        CALL    RESVEC  ;PATCH IN REAL VECTORS
        CALL    LOCTAB  ;SET UP VECTOR PATCHES
;
        CALL    DPRINT  ;DUAL PRINT
        DB      CLS,'Host Version 1.00',CR,LF
        DB      '________________',CR,LF,0
        CALL    RPRINT  ;REMOTE ONLY PRINT
        DB      CR,LF,'[Remote Host Active]'
        DB      CR,LF,0
        CALL    LPRINT  ;LOCAL ONLY PRINT
        DB      CR,LF,'[Local Host Active]'
        DB      CR,LF,0
;
        LHLD STACK ! SPHL ! RET
        DS      60
STACK   DS      2
;
;       +++SUBMARINES+++
;
MOVE:   ;MOVE RELOCATABLE CODE
        LXI     H,RSTRT
        LXI     D,RSTRT+(RELEND-RSTRT)
        LXI     B,DEST
MOVE1   MOV A,M ! STAX B ! INX B ! INX H
        MOV A,D ! CMP H ! JNZ MOVE1
        MOV A,E ! CMP L ! JNZ MOVE1
        RET
;
FUDGE:  ;FUDGE JUMP TO LOCAL VECTOR
        MOV     M,E
        INX     H
        MOV     M,D             ;FUDGE JUMP
        INX H ! INX H!
        RET
;
LOCTAB: ;MAKE VECTORS POINT TO LOCAL ROUTINES
        LHLD    0001            ;POINT TO WBOOT
        INX     H               ;PAST JMP
        LXI     D,0003          ;
        DAD     D               ;TO CONSTAT
        LXI     D,LOCSTAT
        CALL    FUDGE
        LXI     D,LOCIN
        CALL    FUDGE
        LXI     D,LOCOUT
        CALL    FUDGE
        RET
;
FVECT:  ;SECT UP REAL VECTORS IN LOCAL PATCHES
        MOV     A,M
        STAX    D
        INX H ! INX D
        MOV     A,M
        STAX    D
        RET
;
RESVEC: ;SET UP VECTORS INTO LOCAL CALLS
        LHLD    0001
        LXI     D,4
        DAD     D
        LXI     D,STATV+1
        CALL    FVECT
        INX H ! INX H
        LXI     D,INV+1
        CALL    FVECT
        INX H ! INX H
        LXI     D,OUTV+1
        CALL    FVECT
        RET
;
        END
```

Getting On Line

The facilities of Host are fairly powerful. It ties the two consoles together. However, it also allows either console to shut off the remote connection. The local console can re-establish it thereafter. There are routines built in to handle printing to both consoles or to either one of them. Their use is illustrated in the main program shortly after START. They are inline printing routines, that is, you use them like

```
CALL  PRINT
DB    'Cats also swim poorly',0
```

The routine will print the string up to the null, with the program resuming execution on the following instruction. It looks weird but it works.

Most of this fancy I/O is handled through the host configuration bytes immediately after the mini BIOS. Again, these are always in the same place in relation to the start of the Host code and can be located programatically to permit altering them.

Understanding the host bytes will probably serve to explain what the rest of the host code is for.

The TERMON byte is set to FF to activate the remote console. As with all the bytes, it is shown in a default state in the source and can be changed using the appropriate utilities after the code is active. If you want the Host come up in an inactive state, and then be activated at a later time, change this byte to 00 in the source.

SENDNUL is a fudge included for slow terminals and Apples used as terminals. It's quite possible to run the host at ninety-six hundred baud under many systems, resulting in a remote console that's every bit as fast as your local one. Some terminals, however, are a bit sleazy when they encounter carriage returns and will lose a few characters at the beginning of each line as a result.

The solution to this is to send a number of nulls after each carriage return... pad characters which don't print and can be safely gobbled by the system. The number of nulls sent, held in NUMNULS, should be sufficient to ensure a suitable delay but not so large as to slow down the system. This is best done experimentally... get the Host up and running and use DDT to change this byte in the relocated code until you don't loose any data.

Start The Party

Getting the Host on line is fairly straightforward. There are a few things that will have to be altered to suit your system and requirements... all of which are nestled in the equates at the top of the program.

To begin with, you must set either PORTED or MAPPED to YES... but not both. Most CP/M systems are ported. The exception to this is the Apple.

Next, set the four serial port equates to suit your computer. The code is presently set up so that the ported equates relate to port B of a TRS-80 Model II under Lifeboat CP/M and the mapped equates are for a PDA 232C serial card in slot two of an Apple. These have to reflect your hardware or nothing much will happen. Obviously, if you have made the code ported you can ignore the mapped equates.

Change SPEED to reflect your clock speed... or that of your computer... and, finally, set DEST to point to a hole for Host to live in. This last bit is the trickiest.

Host has to go somewhere above CP/M where it won't get hassled by other code. The easiest way is to create some blank RAM above the operating system by using MOVCPM to create an artificially small system. However, this is a small waste of memory and inconvenient. It's also not always necessary.

The equate given for DEST here points to a hole in my CP/M. This is a little patch of memory within CP/M which isn't used... despite the size of the source, Host is actually quite tiny. It can often be relocated into someplace out of the way.

In trolling for holes the best approach is to use DDT to locate your BIOS and look immediately beneath this. As things very seldom match up on even page boundaries it's not uncommon to find three or four hundred spare bytes in here.

The Host system is a really flexible, easily implemented remote console program. While it is shown here as dealing with a single console it's worth noting that it has been distilled down from a larger package which I wrote to handle several. There is relatively little hassle involved in having it talk to three or four.

While making the Host into a fully implemented LAN is a bit impractical... one terminal going off line tends to hang the whole ring... it does lend itself to extending the power of a single micro quite substantially. If you aren't quite ready to spring for something that comes with its own private consultant channel to it as a standard feature you might find the host to be a reasonable interim solution.

As a side benefit, the package is ideal for convincing your less technically oriented acquaintances that your computer has been taken over by dreaded evil spirits. Simply install Host, boot Wordstar and start typing something mystic on the terminal. Messages from the great beyond, communications from the dead.. or the Frigid Pink or any of a number of acid bands... invasion orders from deep space... there's no limit to what these few bytes of code can ooze into the minds of the gullible with a bit of finesse.

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```
775 NEXT X
780 GOSUB 675 'SHOW CHARACTER ON SCREEN
785 GOSUB 530 'PUT MENU BACK
790 RETURN
795 'DO DISK OPERATIONS
800 LINE (6,133)-(174,179),0,BF
805 LOCATE 20,2,0 : PRINT "[S]ave or [L]oad? "
810 C$ = INPUT$(1)
815 IF INSTR("sS",C$)<>0 THEN 830
820 IF INSTR("lL",C$)<>0 THEN 870
825 GOTO C$
830 'SAVE FILE
835 LINE (6,133)-(174,179),0,BF
840 LOCATE 20,2,0 : INPUT "File name";C$
845 ON ERROR GOTO 905
850 BSAVE C$,&HF000,1024
855 ON ERROR GOTO 0
860 GOSUB 530 'PUT MENU BACK
865 RETURN
870 'LOAD FILE
875 LINE (6,133)-(174,179),0,BF
880 LOCATE 20,2,0 : INPUT "File name";C$
885 ON ERROR GOTO 905
890 BLOAD C$,&HF000
895 GOSUB 470 'DISPLAY NEW SET
900 GOTO 855
905 'DISK FILE ERROR TRAP
910 LINE (6,133)-(174,179),0,BF
915 LOCATE 20,2,0 : PRINT "Disk error. Hit a key"
920 C$ = INPUT$(1)
925 RESUME 855
930 'ESSENTIAL SUBMARINE
935 LINE (5,10)-(180,47),1,B
940 LOCATE 3,5,0 : PRINT "Wombat Brothers"
945 LOCATE 4,3,0 : PRINT "PC Character Editor"
950 LOCATE 5,3,0 : PRINT "Copyright (c) 1984"
955 RETURN
```

to a block of RAM that holds code or text the upper characters will generally print up as blocks of random dots.

A character is defined as being eight rows of eight dots each. This is a bit tricky. In fact, for the convenience of the hardware it is taken as eight eight bit bytes stacked one on top of the other. The character A is

```
00000000   00
00111100   60
01000010   66
01000010   66
01111110   126
01000010   66
01000010   66
01000010   66
```

The ones represent pixels that are on. Each horizontal row can be represented as a byte. The first byte... starting from the top... holds the value of zero. The next one holds the value two to the two plus two to the three plus two to the four plus two to the five, or sixty. This is derived from taking two to the power of each bit that is on and adding the resultant mess up.

As such, eight locations of RAM can be used to define a character. Keep in mind that this has nothing particularly to do with the ASCII value of the character. These numbers simply define the shape of the symbol that appears on the screen. If we plug the above eight bytes into the space defined for character one hundred and twenty-eight and then do a PRINT CHR$(128) an A will appear. If we were to replace them with eight bytes of two hundred and fifty-five a white box would show up for the same character value.

On the other hand, the ASCII value of the character is important as a pointer into the character memory. We can specify the location of a character's pattern bytes in a block of memory as be-

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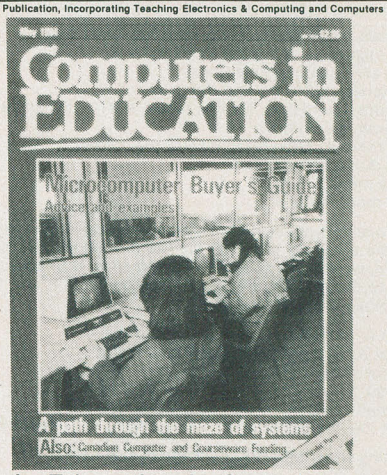

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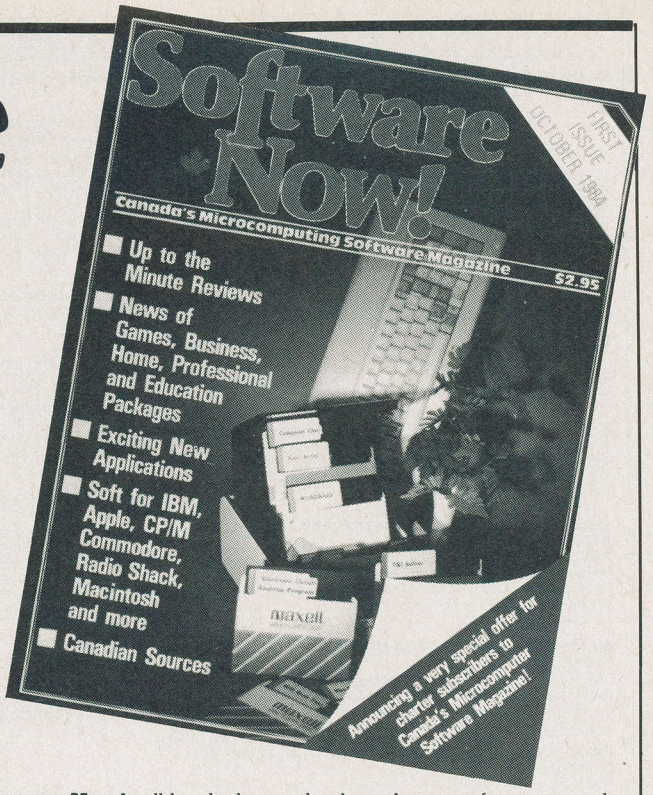

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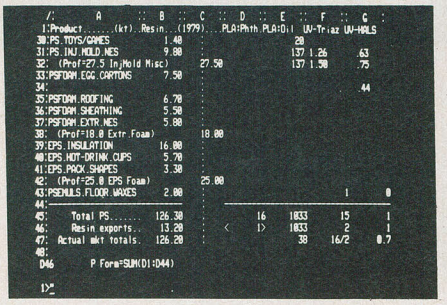

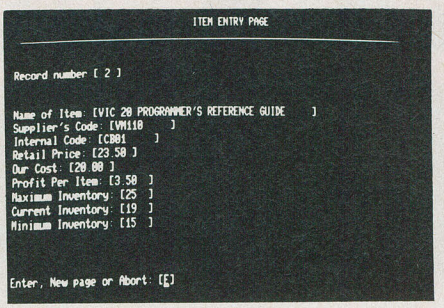

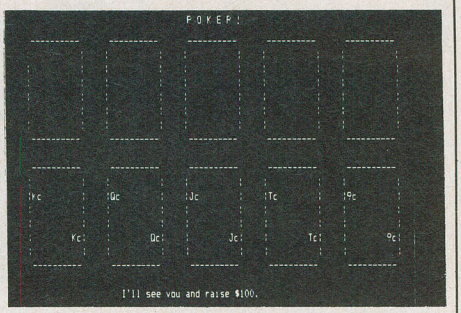

CalcNow

CalcNow is a fully capable spreadsheet package. It can manage a sheet sixteen columns across by twenty six rows deep. It allows for automatic and manual recalculation, full cursor movement, formulae, constants and labels, disk storage of your sheets and a full hard copy reporting function. Its syntax and behavior is very much like that of the popular packages and for models of the size usually used in small business and personal financial planning it's equivalent to professional . . . and very much more expensive . . . spreadsheet packages.

Phone Jack

Most computers have telecommunications hardware built into them . . . it's a shame that they don't all have software available to drive it. This program does basic telecommunications and, while its features do vary a bit from system to system . . . based on what the operating systems allowed us to impliment . . . it does provide for the basic requirements of calling computer bulletin boards and dial up mainframes.

Utility Pack

Most revisions of the disk will also have a choice selection of utility programs. These vary a lot from system to system so it's a bit difficult to describe them all here. However, these are the little routines that make life so much easier when you sit down at the keyboard and switch on.

DataBox

Many commercial data base managers are extremely powerful, extremely expensive and, in fact, grossly over qualified for most tasks. DataBox can handle most of their routine tasks that data base managers are bought for. It is efficient of disk space, reasonably fast and very, very flexible. It can keep track of your files, your stock . . . or even your record collection. It features variable fields, hard copy reporting and flexible search parameters.

Poker!

We wanted to include a game on the disk and, after some deliberation decided that a good dimly lit, smokey card game would fill the bill best. This one simulates five card draw poker in the proper cowboy style. It can deal, draw, call, bet . . . do everything but cheat and pull its six gun on a really bad hand. POKER! features a graphic display of the cards being played.

These programs will vary a bit from system to system . . . the following outlines the formats in which we can supply this software. You will need your own Microsoft compatible suitable BASIC Interpreter (e.g. GWBASIC, BASIC-80, MBASIC, APPLESOFT, RS BASIC, PET BASIC, Microsoft MacIntosh BASIC etc.)

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Birth of a Hero

First there was Robot, the bubble headed ninny, zapping purple aliens by day and arguing with Doctor Smith by night. Then came the efforts of R2D2 and C3P0. Now, from the black emptiness of space to the inner reaches of your basement, you too can build your own metallic Hero.

by Dave Yule and Ed Hoornaert

The home computer had been born without us. We missed the golden opportunities open to those clever souls who got in on the ground floor. We were determined that the same thing wouldn't happen with the home robot.

Only two years ago home robots were just a gleam in hobbyists' eyes. However, in early 1983 Heathkit announced its "Hero 1"... the *H*eath *R*obot. Looking vaguely like R2D2, Hero is a mobile device capable of interacting with its environment through electronic senses. The robot uses an on board microprocessor for its "brain". The optional speech synthesizer and mechanical arm make Hero one of the most versatile hobby robots to have become available to date.

The robot is available either ready made or as a kit. We chose to assemble the kit for both educational and economic reasons. The challenge of building our own robot was tempting and the price tag of just under twenty–two hundred dollars for the kit, compared to almost thirty–eight hundred for the preassembled robot made our choice obvious.

When the huge boxes arrived we soon discovered what a massive job we had undertaken. Hero is complex. We were nearly overwhelmed when we discovered that even such a basic item as the keyboard had to be bolted, soldered and snapped together from scratch.

Have you ever peeked inside an Apple at the components soldered onto the circuit board? Try to imagine all those pieces spread out on a workbench, ready for soldering. Now imagine ten such piles of components. That's Hero prior to birth. Heath says it requires seventy hours of construction time, though twice that is not out of line.

It all sounds very scary, but we found Heath's manuals to be very thorough and easy to read. Even basic soldering techniques are covered. Needless to say, anyone who completes Hero will become an expert at soldering.

In fact, the list of tools needed is surprisingly short. Apart from a twenty five watt soldering pencil all you need are pliers, wire cutters, wire strippers, screw drivers and a crescent wrench. When we had to remove an incorrectly placed component we found a desoldering bulb to be quite useful too.

Hero's Nervous System

Hero's CPU is a Motorola 6808 chip. Though this chip is the decision maker, the CPU board has twenty–five integrated circuits altogether. Many of the others are memory chips, comprising four K of low power CMOS RAM and some ROM. The CMOS permits the system to run reliably on batteries but CMOS chips are more expensive and delicate than regular memory devices.

Because the CPU is the most complex and critical board in the robot it comes fully wired and tested even with the kit version of the project.

Hero's nervous system is the input/output board. Virtually all of the other boards exchange data with it. It was not too surprising that the I/O board took longer to solder than any other board in the kit.

The board has a bit of a catch to it. It uses seven chips with the same number, 74LS374. We mixed them up, though three were packaged separately. All 74LS374 chips would seem to be created equal. However, when we reread the directions we discovered that the three *selected* chips were supposed to go in critical areas of the circuit.

Heath supplied us with a new package of selected chips.

Senses

Hero's senses are too primitive to receive and act on direct communication, but if he's programmed to pay attention he can get feedback from his environment. There are four small sense boards to solder and install, but they are straightforward and quite easy to construct.

The sense board enables the robot to detect sounds and distinguish between light

and dark. There is a motion board which allows the robot to detect the movements of objects. To complete Hero's bat–like sensorial quality there are two sonar boards, one to send and another to receive ultra high pitched sounds.

As you might expect, Hero's communication skills are somewhat limited. He talks to humans through a keyboard, a cassette interface and a remote control teaching pendant.

The kindest statement one can make about the robot's screen display is that it is primitive. The LEDs on top of the case can display only six characters at a time, making it less than ideal for word processing.

Having purchased the optional speech board, our robot can talk. The Vortrax speech synthesizer is ideal for Hero. Being both mechanical sounding and a bit funky, it gives the robot much of its personality. While you can write programs to produce any combination of phonemes, Hero's ROM is preprogrammed with thirty statements. "People stare at me a lot. I suppose its because I'm so short." and "Oh no! I do not do windows" are among its canned observations.

Programs may be entered into the robot's operating system through a hex keypad. A serial cassette port allows recorded programs to be easily saved and recalled.

The most intriguing method of programming Hero involves the teaching pendant. When its long cord is plugged into the robot, Hero operates rather like a glorified remote control toy car. The pendant controls turning, plus three forward and reverse speeds and arm and head movement. In addition, the robot can store sequences of actions in RAM and can then repeat them without the pendant.

Locomotion

Hero goes mobile with wheels rather than legs. While some experimental robots have legs for climbing stairs or crossing rough terrain, most home robots will probably never need them.

Hero's three wheels are controlled by the main drive circuit board. The electric motors and gears in the wheel assembly seemed primitive compared to the technology used in the rest of the kit.

Arms are at the leading edge of robot technology. Most industrial robots are just one big arm, or *manipulator*. If you want to learn about robotics, Hero's optional arm is a highly recommended option. In addition to its educational possibilities it will save you having to get up in the middle of the night to scratch him if he develops an itch.

Manipulators are classified by their number of joints or *axes*. The human arm has seventeen axes compared to Hero's five. That's not too bad... many industrial robots have only four or five axes. One of Hero's joints allows the arm to extend and retract, rather like a turtle pulling in its head. Tiny stepping motors power the movement of each joint.

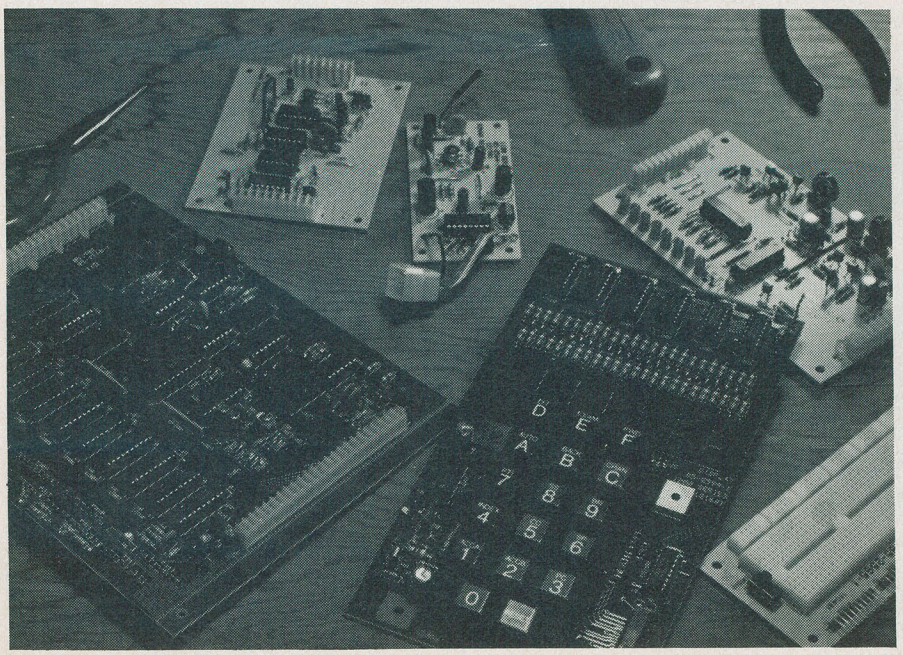
Though small, the boards controlling the arm were among the hardest to build. The shoulder board and the wrist circuit were so crowded that some components had to be carefully soldered onto the back of the board.

Hero's pliers–like fingers lack a sense of touch. Since the robot cannot feel around for a solid grip on an object, precise positioning of the hand through programming is crucial. To add to this limitation, we found that when the robot repeats a movement several times the positioning of the arm grows more and more inaccurate each time.

Imagine Hero picking up dominoes from a box, swinging its arm around and then dropping them into another box. Hero would pick up the first domino perfectly. The second try would be a bit off target. By the fifth or sixth try the manipulator would miss the box completely. Hero would never be able to keep a job on a Ford assembly line.

Because Hero's batteries are only good for about six hours of continuous use, Heath recommends leaving Hero plugged into the charger when not he's operating. However, he has a battery saving sleep mode that provides only enough juice to maintain a program resident in the CMOS RAM chips so he can stay away from the juice for fairly prolonged periods if needs be.

Like a young child Hero occasionally decides to wake up before you expect him to. He was discovered one day bumping around down in the basement. Luckily, the robot also has an off switch, and has never managed to turn itself on.



A selection of Hero's vital organs.

Skin and Bones

The nuts and bolts task of constructing Hero's aluminum skeleton and attaching the various subassemblies to it was not always an easy one. Some of the circuit boards were difficult to mount, especially the I/O board. Many pin connectors had to fit into holes in the skeleton. Lining up the pins and holes was frequently taxing.

Hero's head requires separate construction since it is designed to rotate. The head's being able to rotate allows the robot's sensors to scan in all directions and also facilitates use of the arm. You see, Hero's arm is attached to his head. Isn't everyone's?

It's probably true that Hero doesn't actually have kilometers of wires, but it sure seemed like it as we made up the harnesses. Many wires were short. The ends had to be stripped to precise lengths and tiny spring connectors had to be soldered to them. The connectors were fussy about fitting in the connector shells.

After so many circuit boards we were

Birth of a Hero

finally working on something that looked like a robot.

However, Hero has so many parts, and, as such, so many opportunities for mistakes. Before the robot could be turned on we had to run through a series of extensive checks. All the circuit board components were first checked visually to make sure they were well soldered and in their proper places. Selected pins were tested for correct resistances between the board and ground.

Following partial power up and power supply checks we wondered whether the thing was going to explode in a shower of sparks. Rather to our surprise, everything checked out. The big moment had arrived. When we flipped the switch, Hero didn't explode. Neither did it cry out like a newborn. "Ready" said the metallic voice.

The proud parents congratulated each other.

Our congratulations were perhaps a bit premature. We still had to test the robot in operation. The manual had eight short program listings that would allow us to test and adjust the robot's senses and CPU. Unlike the tests prior to powering Hero up, these were fun.

One of the first programs one runs on Hero sets the CPU's time function, turning Hero into a two thousand dollar roving digital clock. We knew the robot would be useful for something.

Programs to check out Hero's senses came next. We eagerly watched the various LEDs that indicated proper operation of the motion, light and sound detectors. Then we adjusted each board as required.

Our only problem was with the sound sensor. The LEDs kept showing that the robot was hearing something, although the basement seemed quiet. We finally realized that upstairs, at the other end of the house, dishes were being stacked. Hero has keen ears.

The last program posed a more serious problem. The teaching pendant seemed to work since Hero rolled around on command. However, the program was supposed to display certain numbers if all was well. The numbers were wrong. We couldn't tell if the problem was in the pendant or in the program code. A call to Heath told us that the program had a bug. Fortunately, this was one of only a couple of mistakes we found in the huge manual.

The main thing was that Hero worked. All those wires, connectors, diodes, resistors, transistors, clips and chips were all in the right places doing the right things.

Teaching Hero

We realized that our young robot needed a proper education. Unfortunately, teaching Hero is a huge chore. The teaching pendant is fine for some tasks but it can't program the robot to make use of its senses. For example, the pendant can't make Hero use sonar to judge the distance remaining before it crashes into a wall.

Hero is not programmed in BASIC, Pascal, LOGO or any other common language. To program the robot you must use 6808 machine code or the equally abstruse hexadecimal robot language.

For those unacquainted with the joys of machine code, the following program makes Hero say "hello".

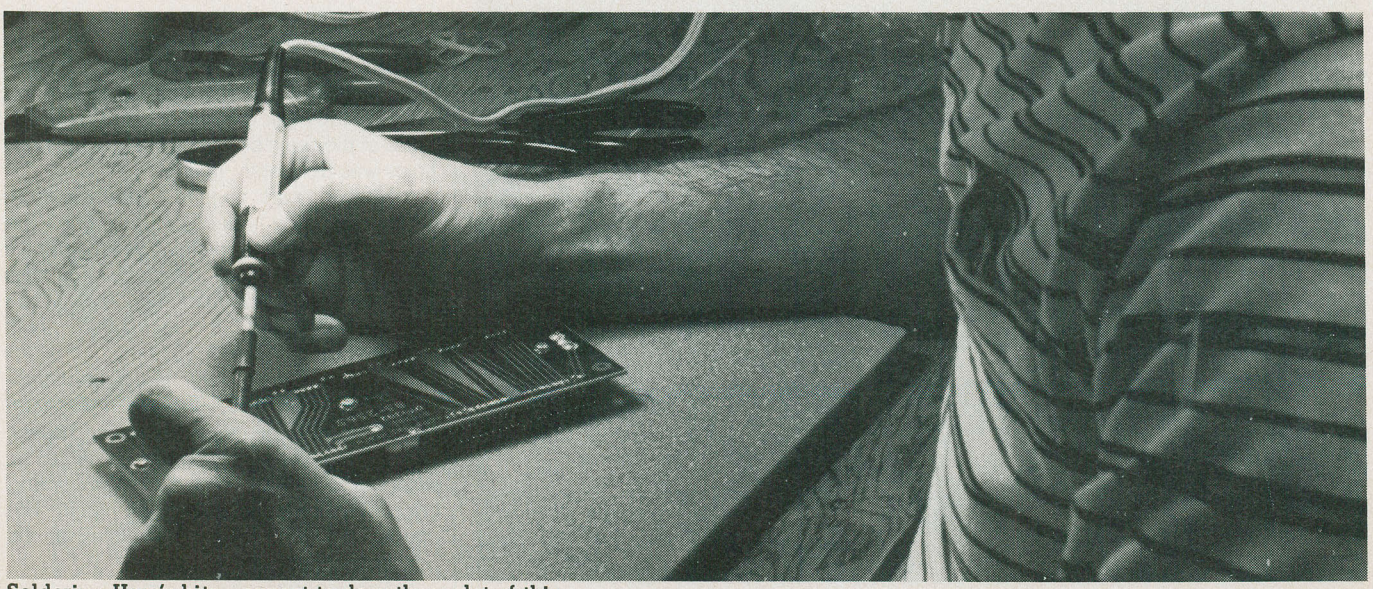
```
RESET
A
A
0090
72
00
95
20
FE
1B
3B
18
35
37
3F
FF
RESET
```

This code is a trifle more difficult to remember than *PRINT "HELLO"*. Even simple robot programs are a chore, the more so as Hero lacks all but a rudimentary editor. Complex programs pose horrendous problems. A mistake in typing or a change in the program means that the entire program must be reentered from that point on.

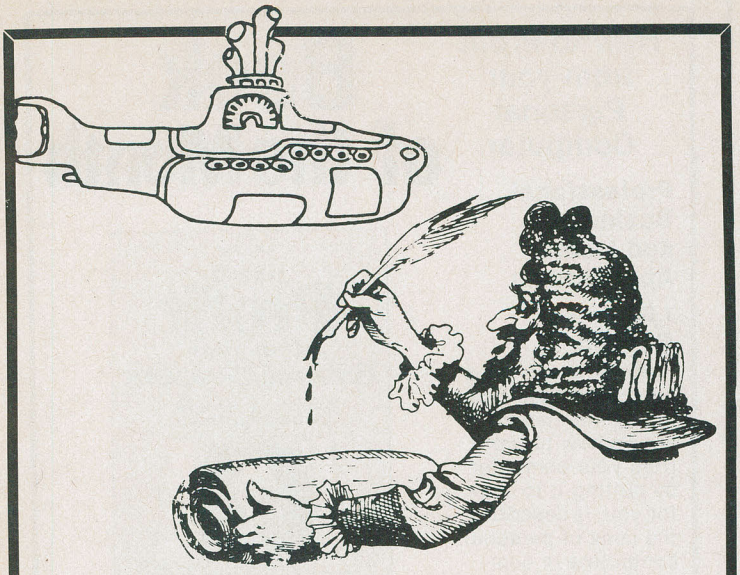
To program efficiently we figure we need a 6808 robot language cross assembler. This would allow one to program in 6808 assembly code. Ideally, the code could then be sent to Hero using an RS232 interface.

All in all, we would say that Hero 1 is a great kit. It's time consuming to put together but fairly easy. The price is a little steep since there are no price wars or clones available. Still, it's a potent introduction to robotics, especially if you shell out another hundred and fifty dollars for Heath's eleven hundred page robotics and industrial electronics course.

Hero, my slippers please. **CN!**



Soldering Hero's bits... expect to do rather a lot of this.



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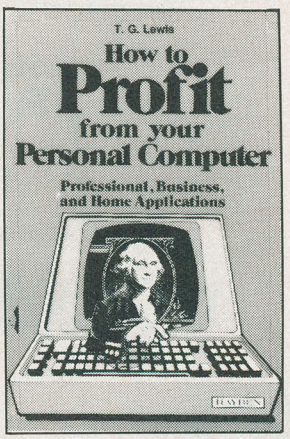

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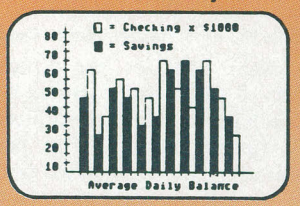

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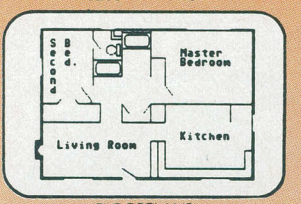

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An IBM PC or XT with at least one drive and DOS version 2 is required for full implementation of course examples. The tuition fee is tax deductible in Canada.

More information may be had by writing Waterloo Distance Education, Inc., at 279 Weber Street North, Waterloo, Ontario N2J 3H8.

IBM's Sidekick

SCOTT'S VALLEY, CALIFORNIA — **Sidekick** from *Borland International* is a resident program that can be accessed at any time while running another application. The program hides in free memory and provides a notepad, electronic calendar and datebook, an ASCII table, autodialler and phone directory.

When called upon, Sidekick interrupts whatever program the user is operating and presents its menu in window format. When the user has finished with the temporary windowed application, Sidekick returns to free memory and control is passed again to the previous program at the exact point where it was interrupted.

Borland International is located at 4113 Scotts Valley Drive, Scott's Valley, California 95066 in the United States.

A new series of high-speed modems have been introduced by *Paradyne Canada Limited*. The **Challenger** series is available in 2400, 4800 and 9600 bits per second models, with the latter two offering an optional four port buffered multiplexer...

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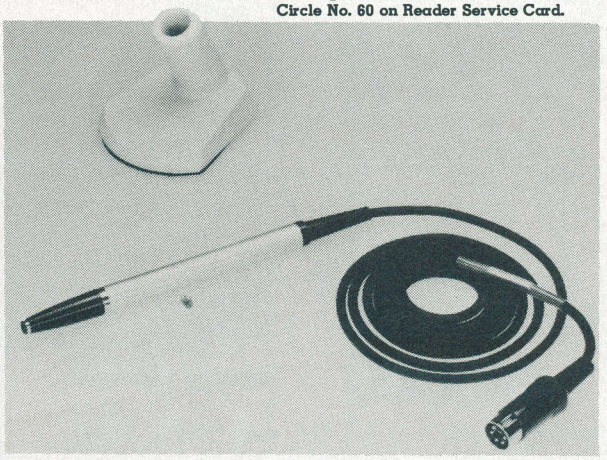

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Nevada Pascal for CP/M-based systems, just released by Ellis Computing and now distributed in Canada by *Vector Computer Services Limited*, joins the successful Nevada software library. Other titles available from Vector include Nevada BASIC, Fortran, Pilot, Cobol and EDIT...

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EMJ Data Systems have announced the Canadian availability of recently released Tecmar **hard disk drives**. A high-capacity drive for the IBM PC and Apple Lisa is available with 70 Mb formatted storage and 45 Mb tape backup, as well as a five megabyte Winchester drive for the Apple Macintosh with removable cartridges...

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A **light pen** for the Epson QX-10 Personal Business Computer has been introduced by *Epson Canada*. The pen connects to its designated port on the QX-10, and has a resolution of 16 dots horizontally and one dot vertically...

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Arnprior-based *Micron Systems Corporation* manufactures colourful magnetic media storage systems. The **Floppy Filer**, offered in sizes holding either 60 or 120 disks, is also available in a locking model...

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The 15th annual **Canadian Computer Show and Conference** will open its doors at the Toronto International Centre from November 19th through the 22nd. Managed by *Industrial Trade Shows, Inc.*, the show will feature David Suzuki as a guest speaker...

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LIST!

Most computer users have at least one major project in the works and we have all experienced the odd sensation of coming out of an analytical fog to discover that the sun is just peering over the rooftops and the night has been spent in revisions. It is for this reason that small programs exist. They can't simulate attacks from the Crab Nebula or figure out the exact value of Pi but they're fun, or clever or just diverting. On these pages we present some of the programs submitted by our readers or dreamed up by ourselves. . . after giving up on the software for the matter transporter.

Readers are invited to submit programs for LIST!. They should be printed out with a reasonably new ribbon. . . we cannot accept hand written or hand typed software. . . and of a length that can be dealt with in one printed page or so (or less). We suggest that the author's name and address appear somewhere in the listing. We pay for programs on publication.

Demand Loan Interest
by Roger N. Tulk

When you sign the loan agreement at the bank for the computer system of your dreams, the manager's eyes inevitably light up. This program, written in Applesoft BASIC, tells you why.

```
1000  REM  DEMAND LOAN INTEREST
1100  REM  BY ROGER N. TULK
1200  PRINT "THIS PROGRAM CALCULA
      TES INTEREST ON A  DEMAND L
      OAN BY THE SAME METHOD THAT
      THE BANKS USE."
1300  PRINT : PRINT "AS BOTH PRIN
      CIPAL AND INTEREST RATE
      FLUCTUATE IN A REVOLVING DEM
      AND LOAN.  YOU MAY CHANGE R
      ATE AND PRINCIPAL AS OF-TEN
      AS YOU WISH DURING A PERIOD.
        THE"
1400  PRINT "PROGRAM WILL ACCUMUL
      ATE THE INTEREST AC-CRUED AF
      TER EACH CHANGE UNTIL YOU RE
      ACH THE END OF THE PERIOD UN
      DER CONSIDERA-  TION."
1500  PRINT : PRINT
1600 CST = 0:TD = 0
1700  INPUT "PRINCIPAL AMOUNT ":P

1800  INPUT "INTEREST RATE  ":I
1900  INPUT "NUMBER OF DAYS AT TH
      IS PRINCIPAL AND IN-TEREST R
      ATE  ":D
2000  PRINT : PRINT
2100 IC = (D * P) / (365 / I * 10
      0)
2200 CST = CST + IC
2300 TD = TD + D
2400  PRINT "DO YOU HAVE A DIFFER
      ENT INTEREST RATE  OR PRINC
      IPAL. AND NUMBER OF DAYS IN
      THE PERIOD FOR WHICH YOU ARE
       CALCULATING IN-TEREST COST?
       (Y/N)"
2500  PRINT : PRINT
2600  GET A$: IF A$ = "Y" THEN 17
      00
2700  REM  ROUND TO TWO DECIMAL P
      LACES
2800 NCST =  INT ((CST + .005) *
      100)
2900 RCST = NCST / 100
3000  PRINT "TOTAL INTEREST COST
      FOR THE TOTAL DAYS  ENTERED
      IS $":RCST
3100  PRINT : PRINT "TOTAL DAYS I
      N PERIOD WAS ";TD:"."
```

Advertiser's Index

Andes Computer Mail Order Centre 21
B&R Enterprises Inc. 15, 79, 93
Canadian General Electric 13
CDI Computer Distribution Inc. 75
Comptree Reseach Inc. 90
Computer Mail Order 53
Computer Parts Galore 56, 57
Computron 64
Dennison 95
Exceltronix 4
Frantek 63
Gentek Computers Inc. 51
Griffco Marketing Inc 2
Hayes Microcomputer Products (Canada) Ltd. 40, 41
IBM Canada Ltd. 48, 49
International Marketing Services 59
JSOFT 59
Mannesmann Tally 3
Mark Gee Enterprises 67
Micro Bazzar Enterprises 31
Ogivar 7
Peripherals Plus Inc. 70
Riviera Manufacturing Co. 72
Romaro Enterprises International Ltd. 89
Scarborough Computer Systems Inc. 67
Smith Corona 11, 47
Softsource 51
Software Show 33
Supertronix Inc. 37
Surplustronics 91
Vector Computer Services Ltd. 55
Verein Corp. 17
Xerox Canada Inc. 96

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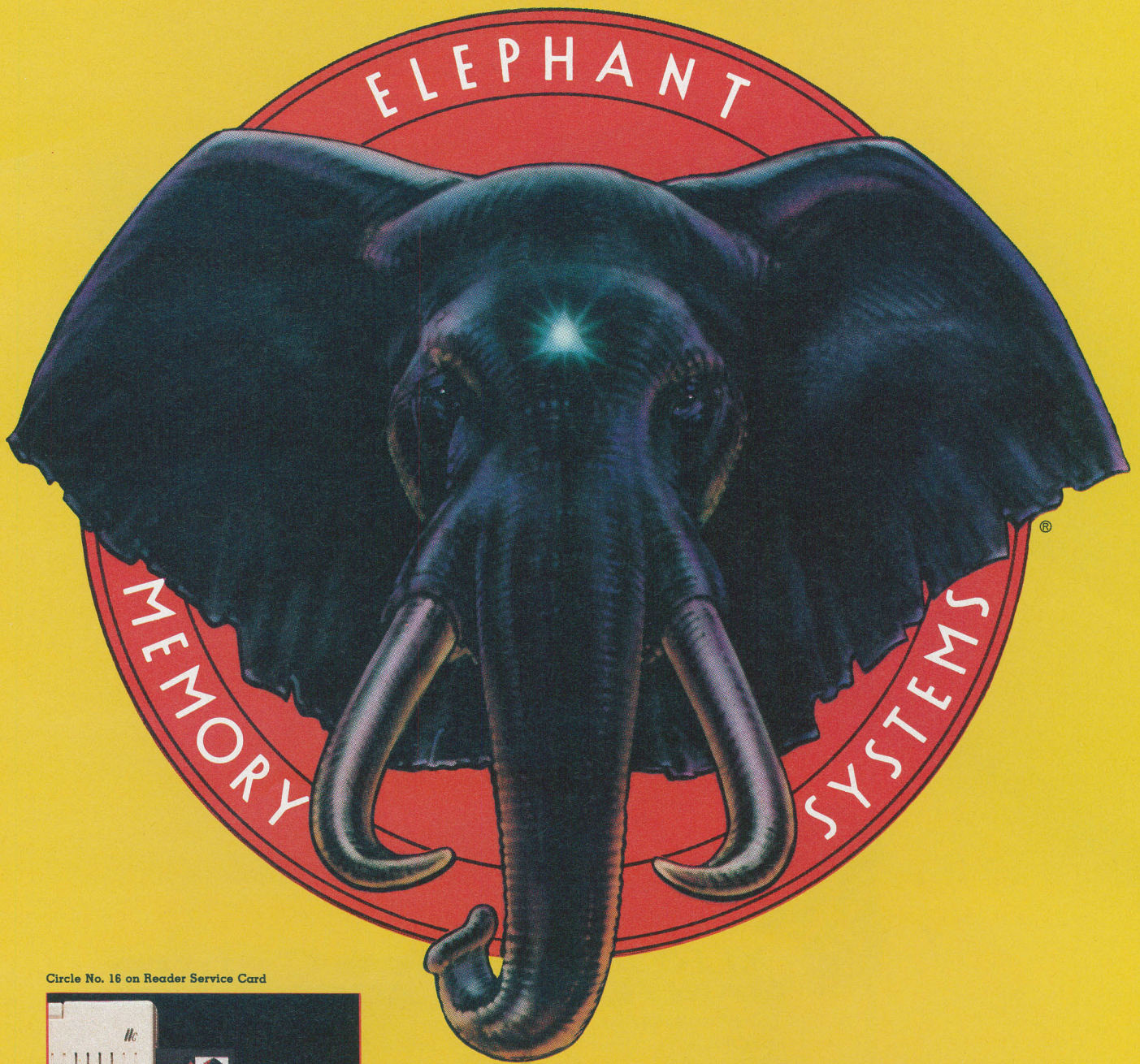

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